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Economy and Patience.

The late C. P. Huntington is quoted as having attributed the accumulation of his fortune of some eighty odd millions to "economy and patience." Of course, we know that when a rich man is asked by a space writer to tell him for publication the secret of his success he is likely to tell him almost anything to get rid of him, and then, too, it has been made apparent on various occasions that not all rich men really know the secret of their own success, simply because the giftie of seeing themselves as ithers see them has na been gi'en them. But, whether Huntington said that or not, it is nonsense and tommy-rot. If economy and patience were all that were needed to accumulate millions, and if the millions could be accumulated in proportion to the exercise of those commendable qualities, then we know a lot of men working in machine shops as employees and proprietors that ought to be much richer than Huntington was but that somehow are not, and are not at all likely to be.

The people of California, who have been for years in the vise-like grip of Huntington's system of railroads and transportation lines, would attribute his wealth to other things besides economy and patience, and the history of the Credit Mobilier, in which Huntington was the leading spirit, sustains their view.

A story is told of him, which is supposed to show his good qualities as a business man, as follows:

"He once boarded an Oakland ferryboat for San Francisco, and, being hungry, strode at once into the restaurant and ordered a beefsteak. Neither the waiters nor anybody else had an idea who he was, and his steak was sent to him, as it appeared to be to most of the customers, fried, done to a crisp, and very unappetizingly served. Mr. Huntington looked around enough to satisfy himself that that was about the style of the establishment, and then at his watch, which told him that the cook had taken so long to spoil this steak that the boat was almost at the San Francisco dock. The only remark he made as he left the restaurant was, 'You must be making a pile of money here.' Nobody paid any attention to him; but the proprietor began to realize who he was on receiving by the next morning's mail a few lines from Mr. Huntington to this general effect: 'The disparity between the food you serve and the price you demand for it is so great that it is plain that your business must be extremely profitable. You can, therefore, probably afford to pay $8 per day per boat as easily as your present rent, $4. The rate is raised accordingly.'"

There is here no indication that he thought for one moment of the right of the traveling public to have decent food for a high price. He thought only of extracting from his concessionaire double the share of the plunder.

Huntington was a man of force and of executive ability. In many ways he rendered an important service to the community, but in considering the life of such a man we are too apt to jump at the conclusion that the work he accomplished would not have been done at all had he not performed it, whereas there is no proof to sustain any such conclusion. We shall probably have numerous homilies from well-meaning persons on the virtues of "economy and patience," but we think impartial history will record that most of C. P. Huntington's wealth was due to other and less admirable qualities, coupled with legislative favors and the granting of monopolies that ought never to have been granted to anyone, but which, supposing them to be granted, he, of course, had as much right to as anyone else.

The Temporary Survival of the Fittest.

One essential feature of the operation of the now familiar law, only so lately enunciated by Darwin, of "the survival of the fittest," is not infrequently lost sight of, and that is that no survival is ever more than a temporary one. The process of evolution in nature and in art is active and unceasing. While the fittest is continually surviving, it is only superseding what was previously fittest, and it is in turn to be succeeded by what shall prove more fit. There is no continual reproduction of precisely the same thing. There is continual differentiation which brings the opportunity for continuously new selections.

The non-recognition of this leads us often to accept as final what is necessarily only transitional, and to prepare for the endurance of what can last but for a time and must then be swept away. When we have built so well—not that we ever build too well—it is discouraging to have to tear down and rebuild. We try to get all that we can out of things before we let them go. We like to wear things out completely, notwithstanding that the last of the wearing out is always a losing operation. Better give up the thing earlier, and often much earlier.

Just now it is the Bessemer process that they are talking about, and there are signs that its days are numbered. The coming of it was one of the most revolutionary of industrial events. It belittled at once the wrought-iron industry, giving us a better metal for nearly every purpose, and which could be produced with one-fourth the fuel and one-third the labor. We are told that in Great Britain, where three million tons of wrought iron were produced annually, only one million tons are produced now, and the results are in the same direction in Germany and in the United States. Now it would seem that the Bessemer process in its turn is one day to become a back number. The open hearth steel process is not only making more marked and rapid progress in its ways and means of

production, but the material thereby produced is also advancing in appreciation and consequent demand. Advanced engineers are acquiring the habit of specifying open hearth steel for a variety of structural and other purposes. The objection to the destruction, or, what is nearly the same, the reconstruction of existing plants because they have cost so much is a trivial one, and it has but one answer. Those who yield first to the inevitable in industrial advancement, and who secure first the advanced positions which become successively attainable, are the first to achieve the latest successes.

The L. C. Carran Company, of Cleveland, O., is the latest addition to our list of Cleveland companies that seem to be unfortunate regarding shipments of oil. They have addressed a letter to P. White & Sons, of Perth Amboy, N. J., in which they state that they have "At the Pennsylvania depot at your place one barrel of extra fine cylinder oil and one barrel of extra No. 1 lard oil." This they offer at special rates for a special reason. P. White & Sons enclose the letter to us, remarking that they "read the 'American Machinist,' and that there is no such oil at the station."

Exports for the Fiscal Year Ending June 30, 1900.

We have just received from the Bureau of Statistics, United States Treasury Department, the "Monthly Summary of Commerce and Finance" for June, 1900, completing the last fiscal year. That year has been an extraordinary one for American foreign trade, which, including both imports and exports, but exclusive of specie, has exceeded the commerce of 1898-1899, the best previous year, by more than $300,000,000, and for the first time has passed the $2,000,000,000 mark. The exports exceed those of any previous year, and have been more widely distributed throughout the world than ever before. Manufacturers' materials have been more freely imported than ever before, and have formed a larger share of the total imports than on any former occasion. Manufactured articles were more freely exported than ever before, and formed a much larger share of the total exports than hitherto. In exports every great class of articles showed a larger total than in the preceding year; in imports every class except manufacturers' materials showed a smaller percentage of the total than in the preceding year, while manufacturers' materials showed a much larger total and larger percentage of the grand total than in any former year. The excess of exports over imports in the years ending June 30, 1898, 1899 and 1900 amounted to $1,689,778,790, while the excess from 1790 to June, 1897, was but $356,809,012.

We print herewith a table showing the official totals of exports of machinery of domestic manufacture for the last three years, as well as for June, 1900.

In every classified line of machinery the year showed an increase over the preceding one, and these increases in several cases are very large. The suspicion is almost aroused that the methods of obtaining returns have been made more effectual, resulting in a closer approximation to completeness in individual classes of machinery. But one factor which must have something to do with the increase is the advance in prices. Evidently the expansion in volume of trade cannot be equal to its inflation in value.

The shipments of electrical machinery in the year 1899-1900 were 58 per cent. greater in valuation than those for 1898-99. The materials for some of the large European railway plants built in this country have, no doubt, been going along, and have helped to swell the total.

Metal working machinery exports were $7,193,390, showing an increase of 11 per cent. in value shipped. This would seem to be just about accounted for by the advances that were made in prices, according to a reasonable estimate. So it may be inferred that the volume of trade in machine tools for the last year has about held its own with the one preceding.

Exports of stationary engines nearly doubled, the increase being 95 per cent. in value as compared with 1898-99. The increase in number of engines was 86 per cent., showing that there has been a great expansion in volume as well as value of exports in this line. The stationary engine trade went backward for a while, being less in 1898-99 than in 1897-98, so that the increase of the last year is in part a recovery.

Boilers and parts of engines showed an increase of 55 per cent. in value. In their case the rise in prices probably was a more important factor of the total valuation than in that of engines.

Locomotive shipments were augmented by 18 per cent. in value, but only about 1½ per cent. in number. The rise in cost is here plainly shown, unless it be true that the locomotives sent abroad in 1899-1900 were on the average larger or of more expensive types than those shipped in 1898-99.

Pumps and pumping machinery exports went up 15 per cent. for the year, not such an advance as that upon stationary engines or boilers.

Printing presses and parts thereof took on the big increment of 44 per cent. in

	JUNE—				TWELVE MONTHS ENDING JUNE—					
	1899		1900		1898		1899		1900	
	Quantities	Values.	Quantities	Values.	Quantities	Values.	Quantities	Values.	Quantities	Values.
		Dollars.		*Dollars.*		*Dollars.*		*Dollars.*		*Dollars.*
Cash Registers		(a)		57,865		(a)		(a)		813,077
Electrical		218,313		494,600		2,052,564		2,736,110		4,328,917
Laundry Machinery		(a)		38,731		(a)		(a)		441,562
Metal-working		609,421		600,127		4,618,683		6,491,586		7,193,390
Printing Presses, and parts of		74,825		118,987		874,515		847,006		1,219,774
Pumps & Pumping Machinery		225,871		271,648		2,023,034		2,710,654		3,108,279
Sewing Machines, and parts of		315,180		424,889		3,136,364		3,264,344		4,540,842
Shoe Machinery		76,659		82,874		895,788		853,936		1,163,265
Steam Engines, and parts of (number)										
Fire	1	3,800	2	1,600	9	7,497	4	13,973	4	14,915
Locomotive	74	719,401	29	365,297	468	3,883,719	517	4,728,748	525	5,592,403
Stationary	86	48,352	120	73,838	565	398,570	605	335,061	1,128	652,976
Parts of, and Boilers		83,077		129,669		927,552		1,132,489		1,756,199
Typewriting Machines, and parts of		235,665		215,845		1,902,153		2,449,205		2,697,544
All other Machinery, etc.		1,665,741		2,046,262		13,336,930		18,722,251		21,913,202
Total Machinery, etc.						31,057,369		44,285,363		55,436,345
Pig Iron (tons)—										
Ferro-manganese					8,403	344,743	495	20,667	16	2,180
All other	15,632	222,753	16,673	338,949	228,465	2,385,252	299,146	3,290,628	160,674	3,122,573
Cycles, and parts of		388,747		278,501		6,846,529		5,753,880		3,551,025

(a) Not separately stated prior to July, 1899.

EXPORTS OF MACHINERY, PIG IRON AND CYCLES FOR JUNE, 1900, AND FOR THE LAST THREE FISCAL YEARS ENDING JUNE 30.

value shipped during the year, and typewriting machines increased 10 per cent.

Sewing machines, which are a line along which our manufacturers are strongly entrenched in foreign countries, gave an increase of 39 per cent. in 1899-1900, the total valuation being more than four and a half million dollars, although they had amounted to more than three millions in each of the two previous years. Shoe machinery exports advanced almost as much —36 per cent.

The miscellaneous category, "all other machinery, etc.," showed a 17 per cent. increase over 1898-99. This "etc." refers to the "parts of machines" only, and is not put there to make room for anything outside of the machinery class.

The total exports of machinery, including the above miscellaneous class, increased in value for the year 1899-1900 $11,150,982, which is almost exactly 25 per cent., or one-fourth, as compared with 1898-99, and $21,378,976, which is 62½ per cent., or five-eighths, above the year 1897-98. Undeniably, this is a tremendously rapid growth.

In view of the known retardation of the export trade in pig iron caused by last year's advances in prices, the showing in this made for the last year is larger than perhaps would be expected. Neither delayed shipments of iron contracted for previous to the advance, nor exports to American countries, nor, still less, the sales that have been made since the resumption of the European buying movement this year, would seem sufficient to account for so small a falling off from figures of 1898-99. However, this falling off was much greater in tonnage than in value, for while the latter was less than 6 per cent., the former was not far short of one-half.

The rapid decline of a once extraordinary, and still large, class of exports is seen in the returns for cycles, which have fallen by nearly one-half.

Commercial Review.

NEW YORK, Saturday, Aug. 18.

THE MACHINERY MARKET.

Much the same states of affairs continue that have been noted in former reports. Hot weather influences are still powerful, and it must not be forgotten that this is Presidential election year, though it is very easy to forget the fact, so apathetic are business men politically as compared with 1896. Inquiries as to the state of trade have been made of men identified with a number of varied lines this week, and replies, good, bad and indifferent, have been received. Reports of improving demand, noted in past weeks, continue to be supported by new ones here and there, giving firmness to the belief that the market is gradually shaking itself free from the not very serious influences that have dominated it of late, and that the future is going to turn out all right.

At the local office of the Buffalo Forge Company there are noticed some indications of a better feeling in trade in the last few days or weeks. Prospective buyers are acting in a more businesslike manner, writing in for final information, etc. Two lines of work which are occupying an increased amount of attention in these times are the induced draft system and the down-draft forge system. It is believed that the next two years will see a great deal of interest taken in the induced draft system. Down-draft forge apparatus was formerly associated chiefly with training schools and the like, but in the last four or five months especially it is being taken hold of in a practical manner. It is being adopted in steam and street railway, shipbuilding and large manufacturing shops. It may be mentioned that down-draft forge equipments have been furnished by the Buffalo Forge Company to the new German Niles and German Garvin machine companies.

A certain prominent machine tool manufactory which has offices in New York and other cities has lately been receiving about its best returns from the New York office. The Boston office has done well, too.

The C & C Electric Company, which has been aware of a falling off in trade in the last few months, now observes that business is looking better all around.

The Sprague Electric Company has received among other orders for motors and generators one from the Cooke Locomotive and Machine Company, of Paterson, N. J., for a standard 300-kilowatt split-pole generator of the belted type. The company reports a heavy business. Lundell fans have been having a big sale, and the sales in the interior conduit department have exceeded those of all previous seasons.

The Burt Manufacturing Company, of Akron, Ohio, has made some important shipments of its Cross oil filters on export orders in the past month. These orders come from Denmark, Sweden, Spain, France, England and Mexico. Notwithstanding the unsettled condition of Europe, its export business is steadily increasing. Two large shipments of Cross oil filters were made to France during the month of July, as the direct result of the company's exhibit at the Paris Exposition. The company has just equipped the Elgin National Watch Company, of Elgin, Ill., with its filters.

Among bids on naval supplies opened August 14 there was but one upon a gun lathe required for the Washington Navy Yard. It was that of Bement, Miles & Co., and amounted to $23,400.

The same-day bids were opened for some machine tools, etc., for the Boston Navy Yard. The Fellows Gear Shaper Company was the sole bidder on a gear planing machine, at $1,292. Hill, Clarke & Co. were the lowest on an eight-spindle multiple drill, at $1,074. On a 60-inch boring and turning mill the Bullard Machine Tool Company made the inside figure—$2,495. The Putnam Machine Company bid lowest on an 18-inch slotting machine—$2,450. Prentice Bros. Company bid $2,700 on three universal radial drills, the lowest figures. The S. A. Woods Machine Company was the lowest on a combined jointing, edging and timber ripping saw at $690, and the Berlin Machine Works on a triple-drum sander, at $1,250. On a 10-ton locomotive crane the lowest bid was that of V. R. Browning, Cleveland, Ohio, at $4,950. There were also some other tools and supplies bid upon.

An important step in the adoption of electricity for power transmission purposes in driving tools is the decision to install that system to a very considerable extent in the government dockyard at Kiel, Germany. According to Consul-General Guenther, the administration, after experimenting with electric power transmission on a comparatively small scale, "has now decided upon a bolder scheme, whereby all the machine tools, etc., installed in the different workshops are to be electrically driven. To this end, a power plant having a capacity of 3,500 horse-power is to be erected. This plant will also supply electrical energy for driving the powerful dockyard pumps." It would be gratifying if American manufacturers could expect to secure the contracts for this equipment. But as Germany is herself one of the most prominent electric manufacturing nations, it is hardly to be assumed that a governmental order such as this will be allowed to go begging outside the country. At least, it is not unless Germans are very different in their national pride from Americans.

The committee of the Port of Barcelona, Spain, will receive bids up to October 2, at the latest, to furnish elevators, etc., for the new building of the commercial depot of that port.

According to a French report, the firm Brower, Boverie et Cie, of Baden, Switzerland, is understood to be constructing large electric shops at Milan, Italy, for which it needs, this month or next, tools and other machinery amounting to upward of $200,000 in value. We are inclined to think this may refer to the works of the new Thomson-Houston Mediterranean Company.

There is a chance for electric lighting apparatus in Haiti. Minister Powell, under date of Port au Prince, July 4, 1900, informs the State Department that the Haitian Government has concluded to furnish light to its cities, and in future not to grant concessions for this work to others. The government will cancel all concessions and pay holders for their plant and for such amounts as have been expended by them. The government also promises to introduce a system of electric lights for the capitol in the early fall.

The French legation in Mexico expects

that Jules Colignon et Cie will establish in that country, at a point not yet specified, a big shop with a capital of 130,000 piastres (Spanish dollars), in which will be made all sorts of valves, cocks, keys, injectors, lubricators, etc.; in general, all steam engine fittings.

The meeting of stockholders of the Pratt & Whitney Company which was to be held this week, to take action in furtherance of the proposed deal with the Niles-Bement-Pond Company, has been adjourned to September 20.

The contract for electrical machinery for the large extension to the plant of the Sydney (N. S. W.) tramways, which, as we have already announced, Charles Oliver, commissioner from the New South Wales Government, came to this country to purchase, has been received by the General Electric Company.

CINCINNATI REPORT.

Conservative machine tool men hereabouts, while they agree that the business atmosphere is very uncertain just now, feel that the future holds great promise. The representatives of those concerns which have displays in the Paris Exposition have less to complain of than others, because some very nice orders have come in during the past week or ten days, a direct result of work abroad. Fred A. Geier, secretary and treasurer of the Cincinnati Milling Machine Company, and H. C. Hoeffinghoff, of the Bickford Drill and Tool Company, are at this writing just sailing from Southampton for this country; they are expected in Cincinnati in about two weeks. The Cincinnati Milling Machine Company reports the outlook for fall and winter very encouraging, and notes the reception of some very nice orders from Europe this week. The Cincinnati Machine Tool Company reports few sales during the current month, but that the turning out of old orders exclusively will keep them busy for the next two or three months. President A. H. Teuchter of that concern is decidedly optimistic on future prospects; he notes that more inquiries were received during the past month than for a long time previously. The drop in the material market has affected the manufacturers of drills and lathes, and machine tools generally, less than those of some other machines.

The business of the Tudor Boiler Company the past five or six weeks is fairly indicative of the situation in the boiler market. Mr. Tudor reports orders six months ahead on special high-pressure goods. Mr. Tudor believes the material market is as low as it can be expected to go, and the probability of an early rise is stimulating buyers very considerably. This company is putting in five high-pressure elevator tanks for the seventeen-story Trust Building here, and has just filled an order for four big boilers of 250 horse-power capacity, each fitted with high-pressure water tubes, for the American Phosphate Company, at Jacksonville, Fla.

Manufacturers of engines have reason to feel considerably elated in contradistinction to the makers of machine tools, inasmuch as there is a steady demand for engines, with a tendency to increase, if anything. Where the machine tool men have depended largely on the jobbers for disposition of their output, the engine people have sold mainly through export agents and direct to the domestic buyer. The Houston, Stanwood & Gamble Company, of Cincinnati, has been prosperous in this regard of late, having just sold five 150 horse-power driving vacuum pumps to the Barr Pumping Engine Company, of Philadelphia; another of 80 horse-power for the Cuban Sugar Company, at Cardenas, Cuba, and having sent a large number South within the past month or six weeks, especially to Florida, fifteen for Memphis, Tenn., Southern California and other Southern States. Through its Buffalo export agents the company has sold two sectionalized engines of 40 horse-power, each to be used in remote foreign countries. Two others have just been placed through its New York exporting house.

The engine builders in this section report trade excellent for August, and inquiries good, and practically all have been running full twenty-four hours a day.

Jobbing houses report increase in sales and demand for the past week over the preceding one, and feel confident that September will open up with its normal, and perhaps greater, activity.

CHICAGO MACHINERY MARKET.

The most telling fact in connection with the electrical machinery market is the prolonged deliveries that are now in vogue. Buyers are indulging in complaints, more or less strenuous, because electrical equipment that was promised a month ago has not yet appeared, and because makers are not giving fresh promises of immediate shipment. These conditions prevail in regard to motors and dynamos of from 100 kilowatts upward, small machines often being kept in stock. All the large electrical machinery builders are well filled with work, some of them say better filled than at any time in their history. Some contracts are now being taken for deliveries to be made next April, and sales for shipment in February and March are common. A few makers can furnish power sooner, but it can be said that except for small motors and dynamos in stock the trade for fall delivery is now over.

This gives to current trade the appearance of a lull, for which no one seems sorry, and which some makers regard in the light of a wise dispensation. Prospective users are tinctured with the prevalent opinion that prices of electrical machinery, like that of all other kinds, will decline, and that the proper course to pursue is to delay purchases. This opinion is not shared by the builders. The feeling is general that a large amount of work will be placed in the near future. Some of it is being figured upon, and some has only been talked about in a general way between the prospective users and their close friends in the electrical business. One project of this latter nature involves the expenditure of about $1,000,000, it is said, but is not yet ready to be publicly discussed.

Last Saturday the Chicago & Alton Railroad Company let the contract for the electrical equipment for its new shops at Bloomington, Ill. The contract was secured by Kohler Bros., for the Milwaukee Electric Company, and includes three 200-kilowatt generators, direct connected, running 200 revolutions per minute, and one 100-kilowatt generator, running 250 revolutions per minute; also fourteen motors, four of 50 horse-power each, seven of 25 horse-power each, two of 15 horse-power each, and one of 10 horse-power.

The Crocker-Wheeler Electric Company has sold to the Indianapolis Railway Company one 200-kilowatt double-end booster, and to the Union Traction Company, of Anderson, Ind., eleven double-end boosters. Trade in small dynamos and motors, less than 100 kilowatts each, is pronounced excellent.

Quotations.

NEW YORK, Monday, Aug. 20, 1900.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:	
No. 1 X foundry	$16 50 @ $17 00
No. 2 X foundry	15 50 @ 16 00
No. 2 plain	15 00 @ 15 50
Alabama Irons:	
No. 1 foundry, or soft	17 00 @ 18 00
No. 2 foundry, or soft	16 25 @ 17 25
No. 3 foundry	15 25 @ 16 25
Foundry forge	14 50 @ 15 50

Bar Iron—Base sizes—The price on dock is 1.25 @ 1.35c. for refined brands, and about 1.70 @ 1.90c. for same from store.

Tool Steel—Base sizes—Good standard quality, 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. and upward.

Machinery Steel — Base sizes — From store, 1.75 @ 1.80c.

Cold Rolled Steel Shafting—Base sizes —From store, 3c.

Copper—Lake Superior ingot, 16¾c., with an upward tendency; electrolytic, 16⅝c.; casting, 16⅜ @ 16½c.

Pig Tin—31⅜ @ 31½c. for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4¼c., with .02½ @ .05c. extra for carloads, New York.

Spelter—Prime Western, 4.20c., New York delivery.

Antimony — Cookson's, 10¾ @ 11c., though concessions in exceptional cases are hinted at; Hallett's, 9½c.; United States, 9⅜ @ 9½c. Some brands are obtainable at 9¼c.

Lard Oil—Prime City, present make, 55 @ 57c. in 1 to 5-barrel lots.

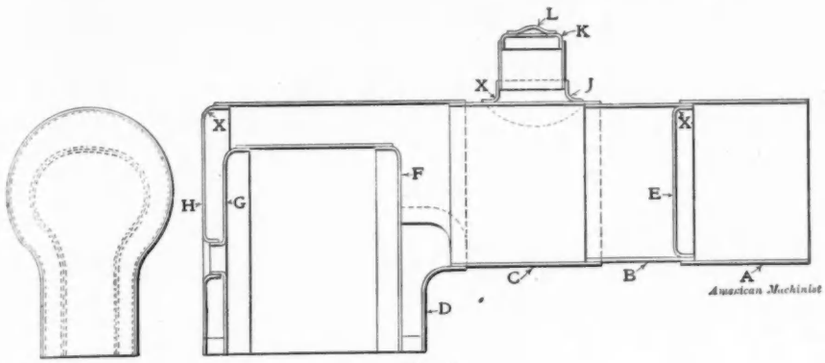


Fig. 1

DETAILS OF A LOCOMOTIVE BOILER.

furnace to the hydraulic press and to other parts of the boiler shop. These trucks have handles about 10 feet long, so that the men who handle them will not be overcome with the terrible heat. The plates are allowed to stay in the furnace for about half an hour, or until they are almost to a white heat, when they are pulled out on to the truck by means of hooked rods about 12 feet long, which resemble an ordinary stove poker. From the furnace they are taken to the hydraulic press, where they are placed in the dies and pressed into the required shape.

The press and the operation of the same are very interesting. A rough sectional

Turning Flanges on a Locomotive Boiler.

BY H. D. VANDOORN.

Probably very few readers of the "American Machinist" have ever seen or heard much about the methods employed for turning up the flanges on a locomotive boiler. Such subjects are generally discussed in the papers which pertain to boiler work, and, as a rule, are read only by those directly interested in such subjects; but, as it is a purely mechanical operation, it seems to me that it will be interesting to the readers of the "American Machinist."

The general type of a locomotive boiler is shown in Fig. 1. *A* is the smokebox, *B* the first course, *C* the second course, *D* the throat sheet, *E* the front tube sheet, *F* the back tube or front firebox sheet, *G* the back firebox sheet, *H* the back head, *J* the dome collar, *K* the dome ring and *L* the dome cap.

The parts *E, F, G, H, J, K* and *L* are all flat plates to start with, but the edges or flanges, as they are called, must be turned over as shown at *X*, so that the straight sheets of the boiler may be riveted to them.

The old-fashioned way of turning these flanges was to heat a small portion of the edge of the sheet in a coke fire, and then two men at a time would hammer the edge over until the metal became too cold to work; then the sheet would be put back into the fire and a new place heated, and so on until the sheet was completed They usually had what was called a "former," which was a cast-iron form of the desired shape, and the sheets were hammered down over these forms. It was necessarily an expensive job, because of the large amount of time consumed in heating only a small portion at a time. The men would probably stand idle most of the time that the sheet was heating. It was also a very laborious operation, for the men were obliged to "strike while the iron was hot." They used heavy sledges or mauls for this work. They were obliged to relieve each other, there being generally two sets of two men each to strike at each heat.

The modern methods are very different. The plates are first sheared to the proper size and then put into a large furnace. The temperature of the furnace is about 1800 degrees Fahr. The front of the furnace is a large door, which draws up to allow the plates to be placed on the bottom, which is composed of a number of rolls. The rolls are on a level with the hight of the two-wheeled trucks which are used for transferring the plates from the

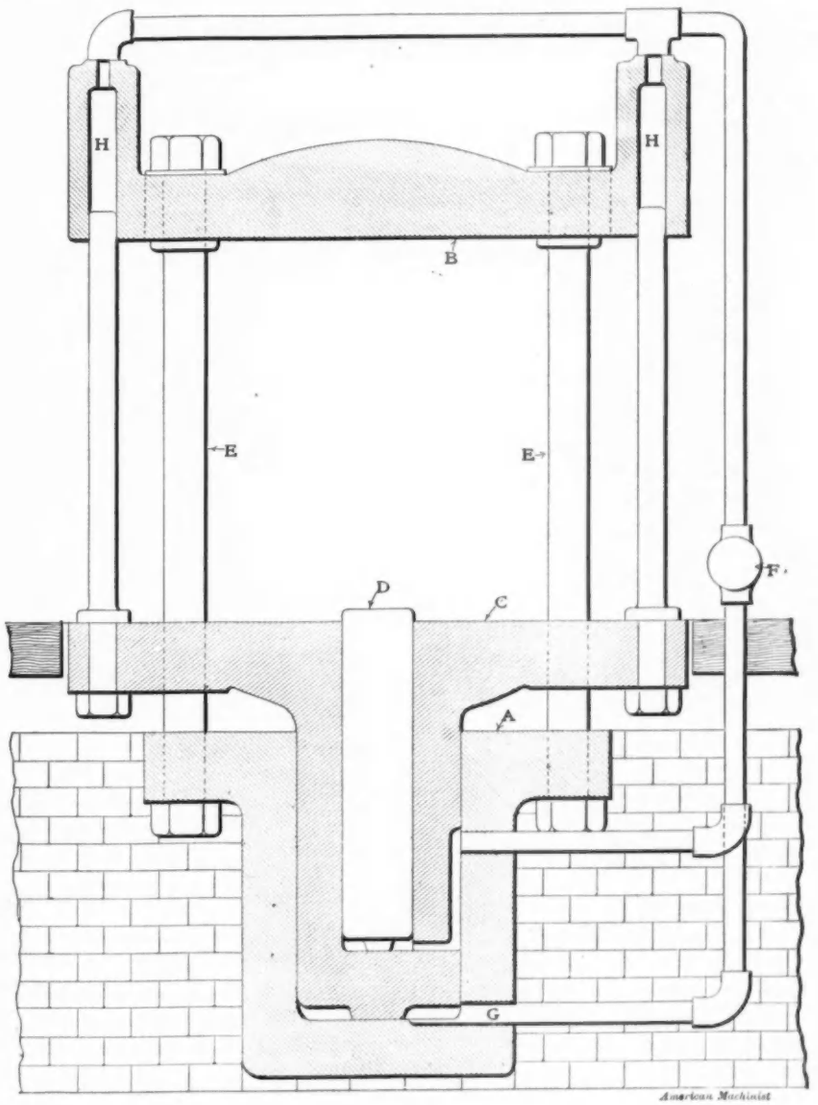


Fig. 2

HYDRAULIC FLANGING PRESS FOR BOILER WORK.

view of the press is shown in Fig. 2. *A* is the foundation casting, *B* the top and *C* the bottom platen, *D* the center plunger and *E* are four steel posts. The posts *E* are held in the foundation casting, and the top platen *B* is secured to the top of these four posts by the nuts shown.

A triple valve is shown at F, which raises the lower platen *C* by admitting

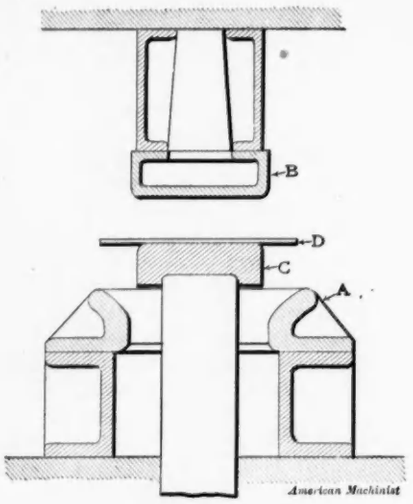


Fig. 3

FLANGING FRONT TUBE-SHEET—BEGINNING OF OPERATION.

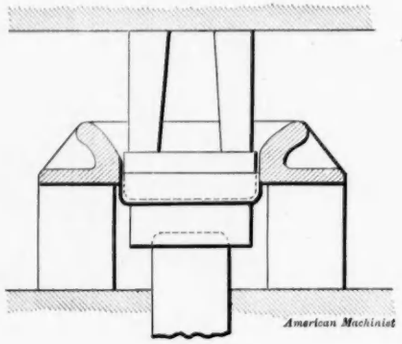


Fig. 4

FLANGING FRONT TUBE-SHEET—OPERATION COMPLETED.

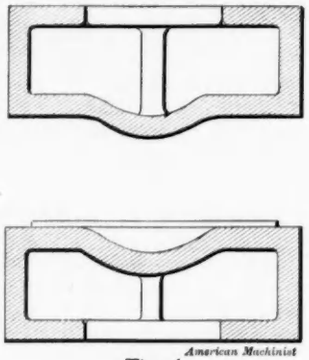


Fig. 6

FORMING DOWN CAP.

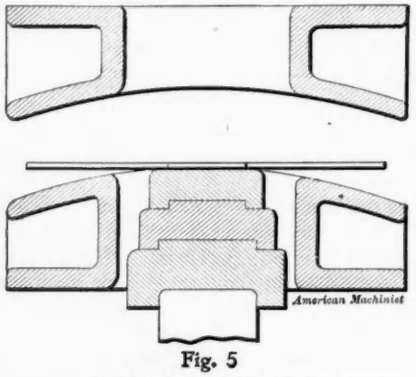


Fig. 5

FLANGING DOWN COLLAR.

hydraulic pressure at *G*, and forces it down again by means of the push-back cylinders at *H*. The third opening in the valve raises the center plunger *D*.

In flanging the front tube sheet *E* the dies would be set on the machine as in Fig. 3, *A* being the female die, *B* the male die and *C* the presser plate. The sheet is first put in on the presser plate as shown at *D*, then the presser plate is forced up against the male die, and then the female die ascends and turns the edges of the plate over the male die, as shown in Fig. 4. The front tube sheet *E*, back tube sheet *F*, back firebox sheet *G*, back head *H* and dome ring *K* are all flanged in this manner.

In flanging the dome collar *J*, a hole is first cut out of the center of the sheet about the right size. The dies are set as in Fig. 5, the sheet being placed between the upper and lower female dies. The lower die acts as a presser plate and forces the sheet against the upper die, and then the center or male die is forced up through.

In forming the dome cap *L*, only two dies are necessary, the male and female, as in Fig. 6. In this case the female die can be made to sit on either the lower platen or the center plunger.

After the pieces come from the press all that is generally necessary to do is to trim the edges smooth. Of course there is a certain amount of shrinkage that takes place in the sheets, and this is taken care of by making the dies that much too large, the same as in pattern work. This shrinkage is variously estimated at from .0065 to .0119 to the inch, according to the thickness of the plate.

New Universal Milling Machine.

Geo. Richards, of Brussels, Belgium, has designed a new style of milling machine on which he has obtained United States patents, and which is being manufactured by his company, known as the "Compagnie Continentale Geo. Richards," of 102-104 Rue de Louvaine, Brussels. The special objects sought in the design of this machine have been to do away with the overhanging knee and support the platen upon the frame of the machine itself, and yet to so arrange that the machine shall be handled in precisely the same manner as though it were of the usual construction; so that those who have become accustomed to the present machine will have no new motions to learn in order to enable them to handle the new machine with facility. It has also been found desirable and quite feasible with this construction to provide for a greater traverse

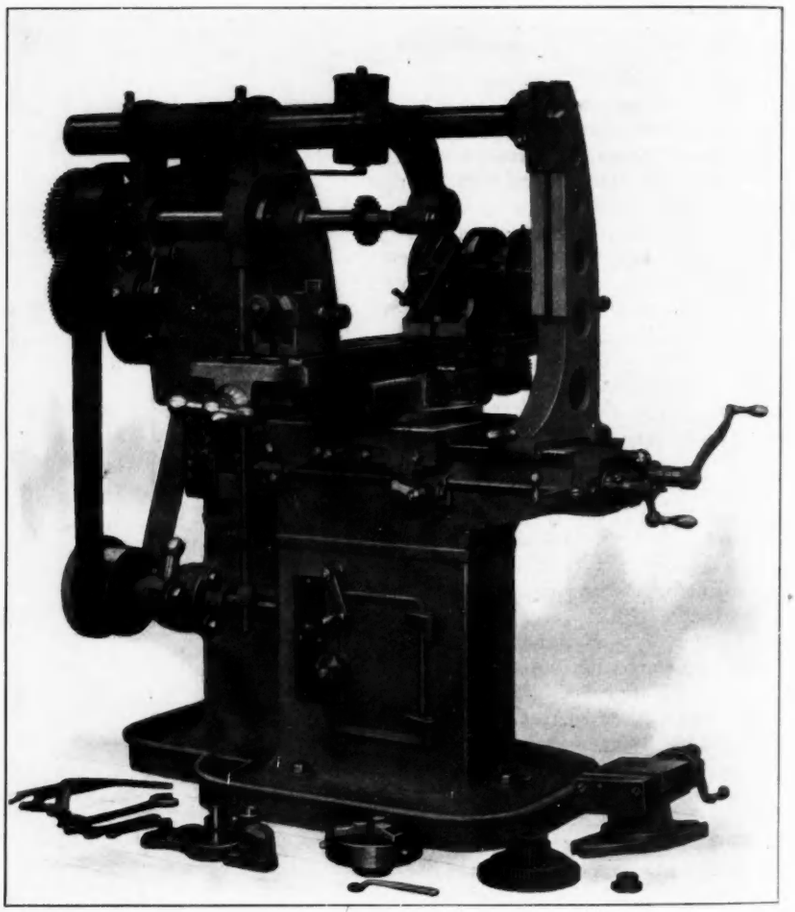


FIG. 1. THE RICHARDS UNIVERSAL MILLING MACHINE.

of the platen in line with the spindle than is customary, or indeed possible, with the usual construction.

Instead of moving the platen vertically the saddle upon the upright is moved for the vertical feed, but this is done by means of a crank-handle, which is located as is usual for the one that moves the knee; the motion being carried from the horizontal shaft to the screw by means of spiral gears. The broad belt seen drives the spindle by the single pulley that is placed upon the latter, and it passes under an idler just below the spindle, up over a pulley at the end of the cone pulley and down to the lower pulley, which serves not only as an idler for the driving belt, but the feed motion is derived from it also; variations in the rate of feed being obtained by a friction-disk drive inside the base of the machine, which has an attached index, as shown, at the side of the door, and is set to feed at any desired rate by the crank just above the door.

Automatic feeds are provided in all directions, and by an ingeniously simple arrangement the one rod that passes along just below the saddle is utilized for the automatic release of both the saddle and the vertical feeds. When the saddle moves upon the bed the inclined-plane tappets can be set to depress the small lever at any desired point, and this releases the feed by moving the rod endwise to the left. The vertical feed is thrown in by moving this same rod still farther to the left, and when this is done the inclined planes, which are adjustable on the vertical rod attached to the upright saddle, will move the feed rod forward at any desired point, and thus release the vertical feed.

The outboard bearing is supported upon a substantial post, which looks as though it were an integral part of the machine and designed with it, and by an extension of the overhanging arm it can be supported by this outer upright when desired. The extension of the arm can be taken out when not needed, or the arbor can be supported directly in a bushing attached to the post; while at the same time, if the arbor being used is a long one and has

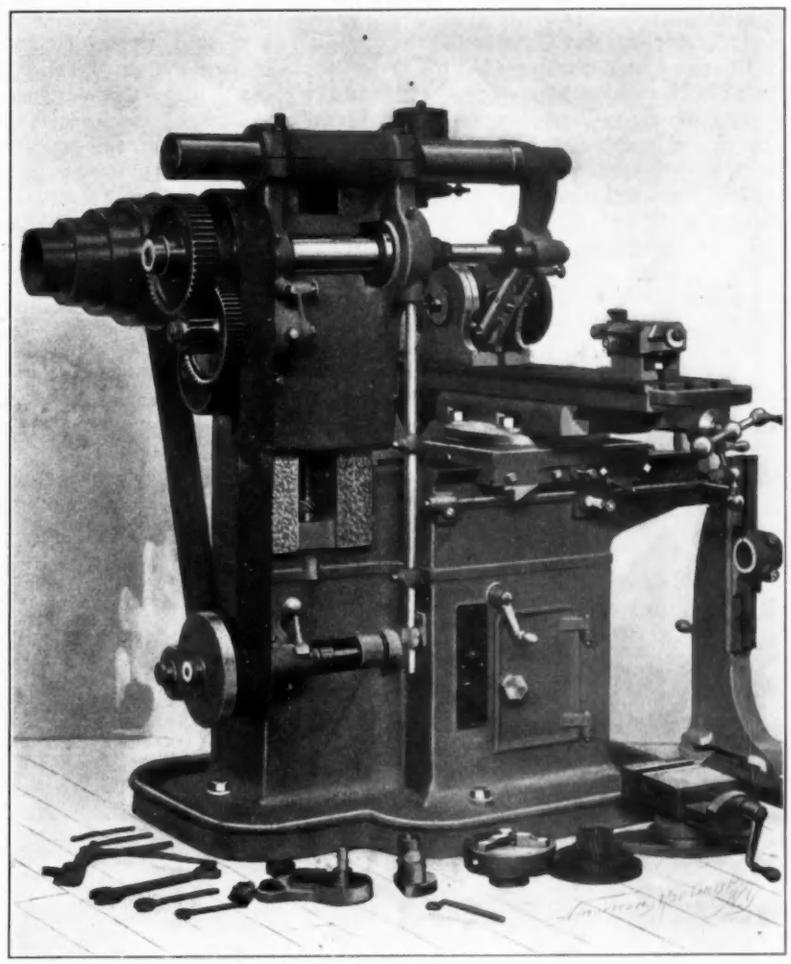


FIG. 2. THE RICHARDS UNIVERSAL MILLING MACHINE.

cutters far apart, a bushing may be fitted to the larger hole in the end of the overhanging arm, which bushing may be fitted to a collar placed upon the arbor at any desired or convenient point. In addition to the usual class of work done upon a universal milling machine, this one is intended for other work not usually done upon such machines; the smaller view showing it arranged for boring by the use of a boring bar, and thus arranged it will bore holes at any required angle to each other, as well as parallel, the graduated movements being very convenient for the precise location of holes bored.

A variation of the machine is shown at

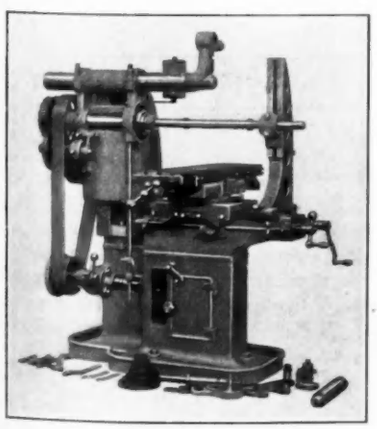


FIG. 3. RICHARDS MILLING MACHINE ARRANGED FOR BORING.

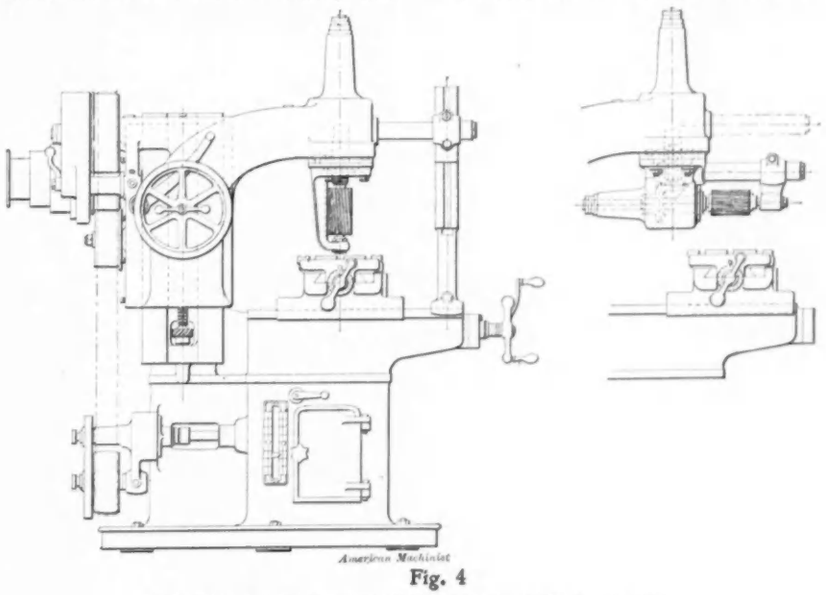


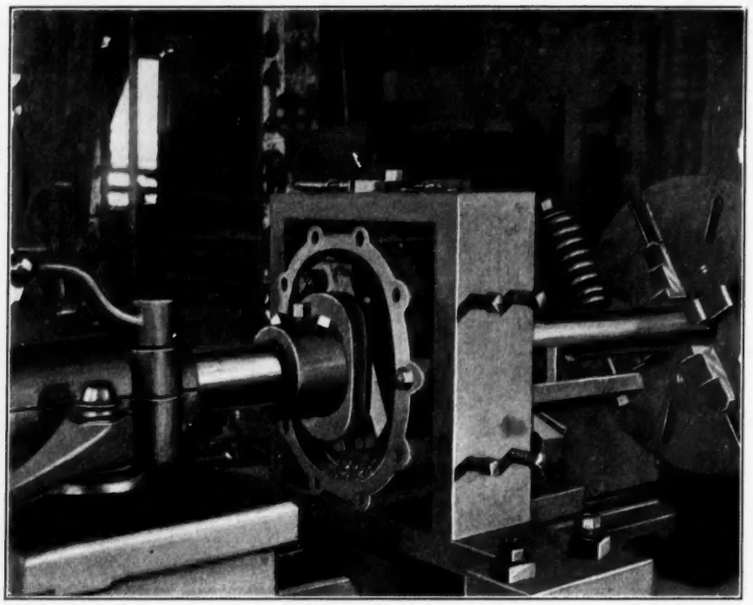
Fig. 4

RICHARDS MILLING MACHINE WITH VERTICAL SPINDLE.

Fig. 4, in which it is arranged especially for a vertical spindle and (as shown at the right) so that a head carrying a horizontal spindle can be attached very readily. The machine indicated by Fig. 4 is a plain one, but of course it may also be universal if desired, and the machines are in fact built in various styles and sizes by the company named.

Boring Irregular Shapes.

We illustrate a device which is entitled to respectful consideration from the fact that it has been in successful and satisfactory operation for seven years. At the Soule Feed Works, Meridian, Miss., they build feeds for sawmills, and the motor which operates the feed is a rotary engine. The interior of the shell in which the piston rotates is not round, and the special device here illustrated was devised for boring to the special shape required.



BORING A HOLE OF IRREGULAR OUTLINE.

The half-tone, Fig. 1, shows the device in actual use, and the sketch, Fig. 2, will sufficiently show the principle of its construction and operation.

It will be seen that the piece to be bored is secured in a special casting with provision for setting it correctly and for holding it securely. This casting is fastened to the rest of a 36-inch lathe, and the rest is fed along, carrying the work over the revolving cutter. In Fig. 2 *A* is the tailstock spindle and *B* is a boring bar turning on the centers. On the tail end of the boring bar is a casting *C*, securely fastened, with a cross-sliding tool carrier *E* just clearing the end of the bar. There is a slot through this carrier to clear the center. On the end of the tailstock spindle is fastened the former *A*, the flange *a* of which is made of the proper shape to give the required movement of the slide *E* and the cutter *d* which it carries. The roller *e*, on a pin projecting from the slide *E*, is held in contact with the former surface *a* by the operation of the lever *o*, which swings on the fulcrum *i*, and the compression spring and rod pulling on the short end of the lever. *C* is notched out to clear the long end of the lever. The extreme end of the lever is rounded, forming a pin which goes partly through the slide E.

By changing the outline of *a* other shapes may be bored as required. The shells for the rotary motors, after they are bored, are lined with tempered and ground sheet steel, No. 16 gage. When this lining wears out it can be removed without requiring the reboring of the shell or any change of its size or shape. As the shells to be bored are not long, the projection of the tail spindle gives more linear movement than is required for the boring. As will be readily understood, this device can be made to bore nearly as fast as if boring truly cylindrical holes. Half-inch square self-hardening steel is used for the tool.

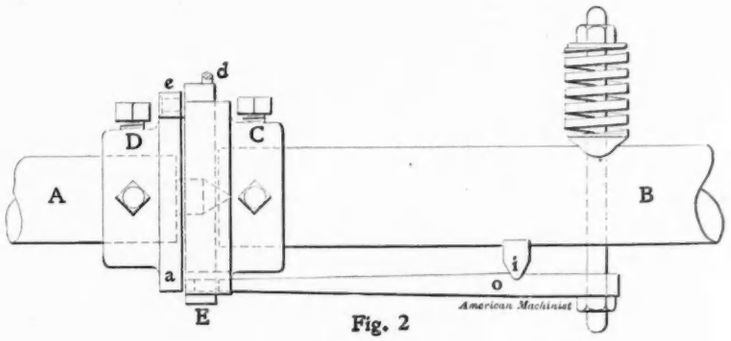


Fig. 2

BORING DEVICE FOR IRREGULAR SHAPES.

A Staff Lathe.

BY A. H. CLEAVES.

Staff, I presume, is another name for arbor; at any rate a staff lathe is one that has been used extensively in watch and clock work for a good many years, for turning straight and taper work and shoulders on wheel arbors, etc.

At the time the lathe was named I suppose the term "staff" was more commonly used than at present; but whatever the name, the machine has been of much the same importance in the line of work to which it is adapted as the turret lathe in larger work.

I think Mr. Mosely, of watch-factory fame, was the designer of the following machine; and while others may differ in a number of details, this one is a good illustration of their general character.

In Fig. 1 a front-view section of the machine and some of the parts are shown. *A* is the frame or body casting, *B* and *C* the head and tailstock; the usual order, if I remember aright, being reversed from most lathes—the driving head being in *C* (right hand) and the tool-post being on the back of the machine.

G is the lateral shaft, or the one that carries the tool for turning. This shaft contains a loose internal shaft *H*, shown also in Figs. 7 and 8. It has a projecting lug or stud which takes a lateral movement from a face cam *I*, Fig. 3. This cam movement is positioned by means of the adjusting screw *J* touching a hardened seat in the shaft *G*. Different cams are used for different lengths of cut; and while the length of the cut is not affected by *J*, moving *G* with *J* carries the tool-post to any required place on the work.

The spring box *K* contains a stiff spring which holds *G*, *H*., etc., up to the cam face, and the screw *L* with lock-nut regulates the facing out or shoulder work. The slotted sleeve, Fig. 8, permits the lateral movement of *H* without revolving. But *G* having *D* fast to it with pin or set-screw can roll a short distance. *D* and *E* have close side-fits, and *E* rolls on *G*.

Fig. 3 is a left-hand elevation of the machine, and Figs. 4 and 5, right-hand ones in section; the hand-rest *O*, a casting with hard rubber rod on the edge, being the front of the lathe. In Fig. 4 *D* is the tool-

post casting. The tool-post has a rocking seat for up-and-down adjustment. The rocker is held against the adjusting screw by a stiff flat spring.

The arrangements in this machine for excluding dirt are admirable. The casting F is a segment of a cylinder, and rolls on the curve of the projecting parts of the head and tail stocks *B* and *C* with a chance to move laterally. The center of *G* is common to these curves. *D* fits an opening in *F*, which is placed before the tool-post parts are assembled. Then the tool-post rocker has arcs on its front and back, meeting screen plates. Another plate *P* meets *F* on the back.

The turning tool is adjusted for cut with the thumb-screw *S* against *E*, the adjustment being held by the spring and pin at *R*.

The complete carriage, including *D* and *E*, is held to the work whether turning straight or taper, by the roller, seat and long bow spring seen in section at *T*. The whole is covered with a beveled-edge slide put in the casting.

Straight or taper work is obtained with the parts at *U*, Figs. 4 and 9. *U* is a hardened slip or bar brought to place with the screw *V*. A rocking seat *W* on the end of the adjusting screw *X* slides on the under side of the bar *U*, giving straight or taper movement to the tool through *E*. The spring shown on the upper side of *U* keeps the latter against *W* when the cutting tool is facing out, or when the carriage drops down. *U* is held in a box *Y* attached to *Q*. The latter, *Q*, is a casting for the cam shaft *N*, shown in several places. This shaft faces out shoulders by carrying the cam, Fig. 11, over the hardened piece *Z* in *E*, Fig. 4, depressing the latter and carrying the tool out, while

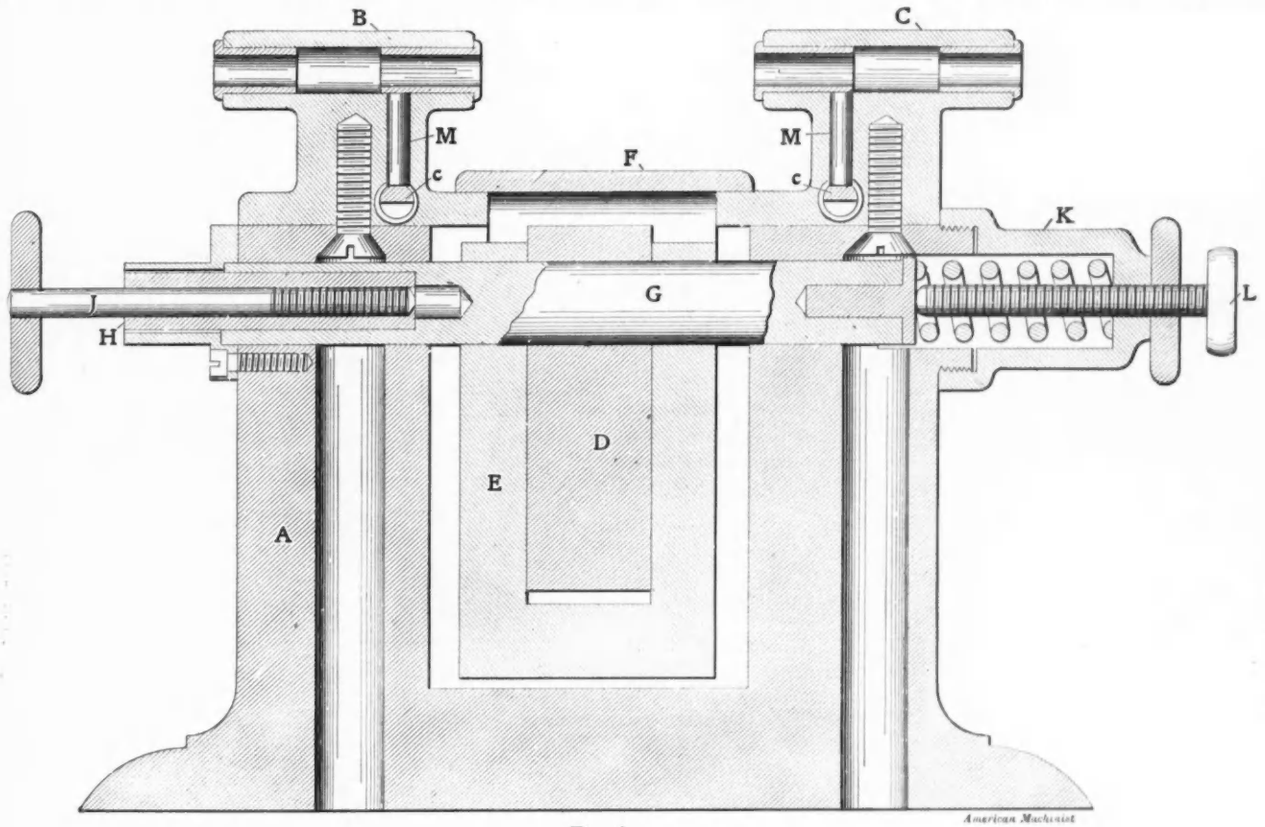


Fig. 1

LONGITUDINAL SECTION OF STAFF LATHE.

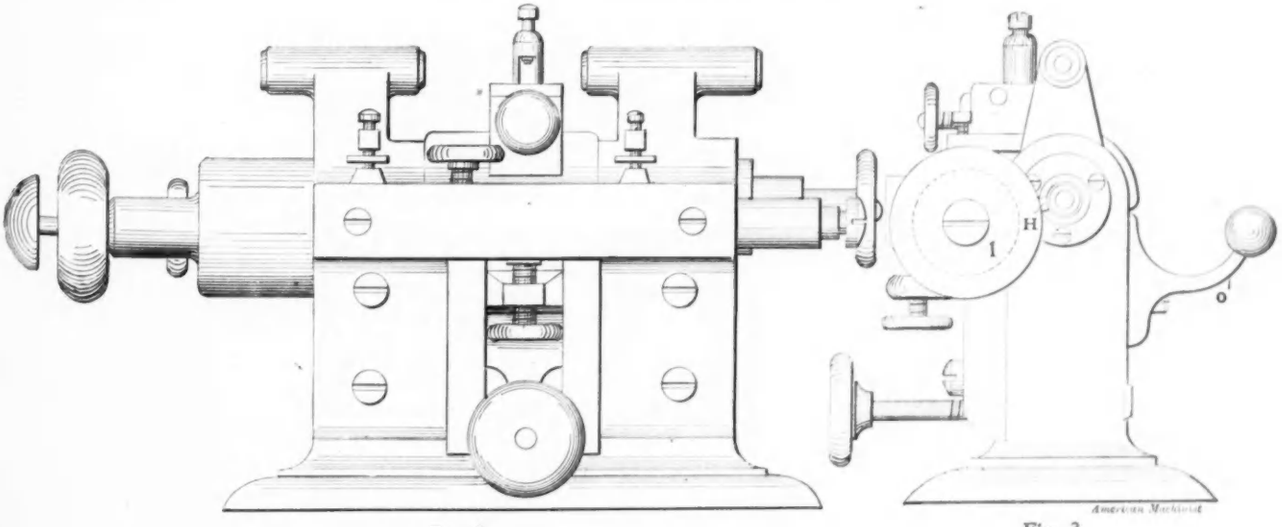


Fig. 2 Fig. 3

SIDE VIEW OF STAFF LATHE.

the face cam *I*, Fig. 3, is acting on *H* with straight part of face. The cam, Fig. 11, is long enough for end movement and change of position of carriage.

The shaft *N*, Fig. 10, has two flat spots *a a*. As these pass under the pins *b b*, Fig. 5, they release through the spring bars the locking pins *M M*. These two pins fasten the head and tailstock spindles. When the machine starts these are locked before any of the turning mechanism starts to work. The lathe is stopped automatically at the same time these pins release the spindles. The pins *M M* bind the latter by pressing the long split bushings. Fig. 6 gives three views of *E*.

Fig. 10 gives in detail the worm gear parts to some extent. The push rod and

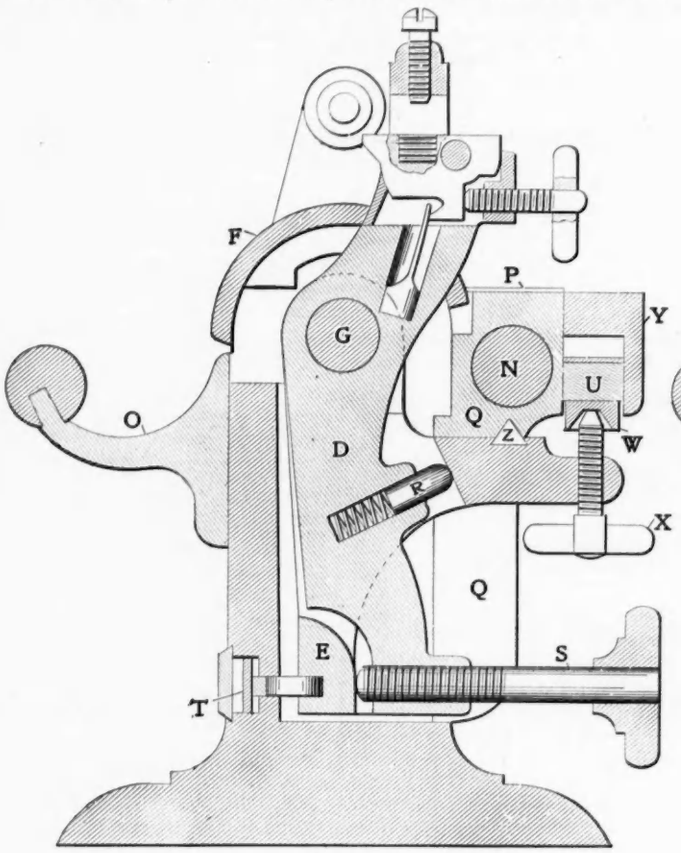


Fig. 4

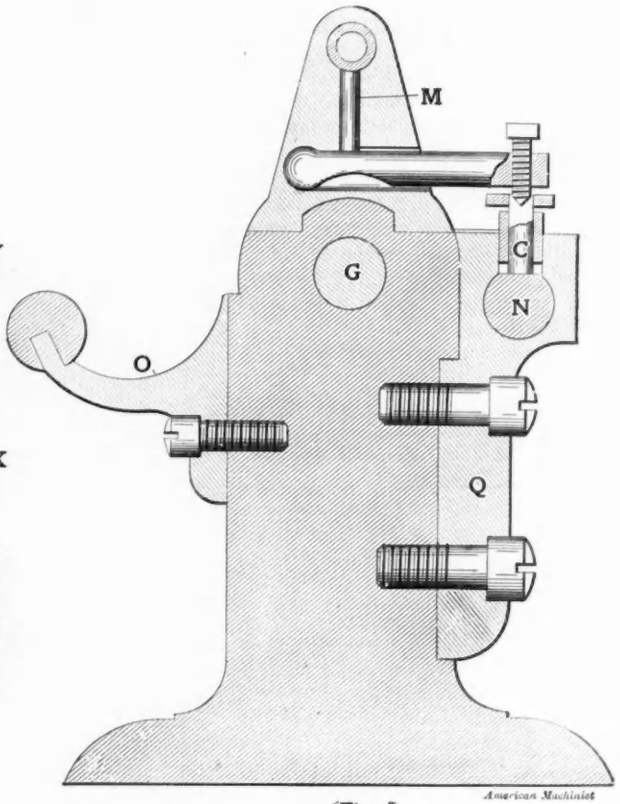
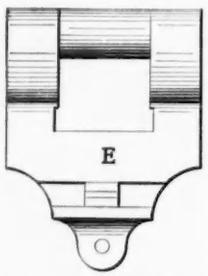


Fig. 5

CROSS SECTION OF STAFF LATHE.



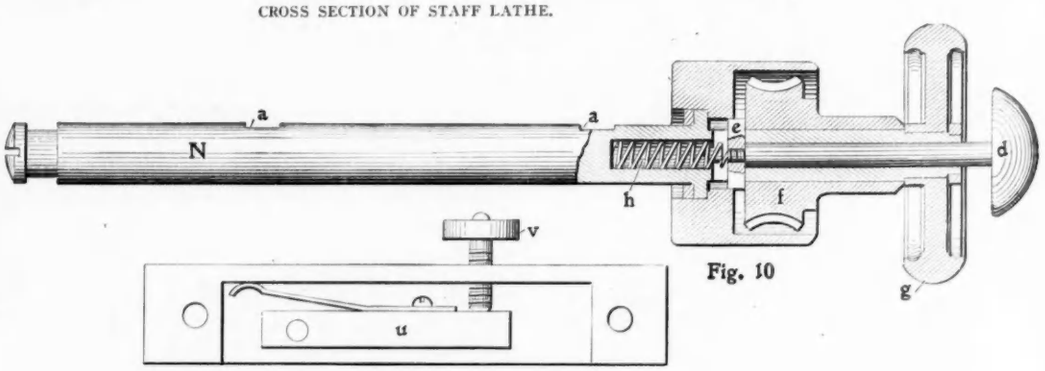
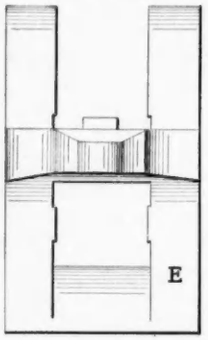


Fig. 10

Fig. 9



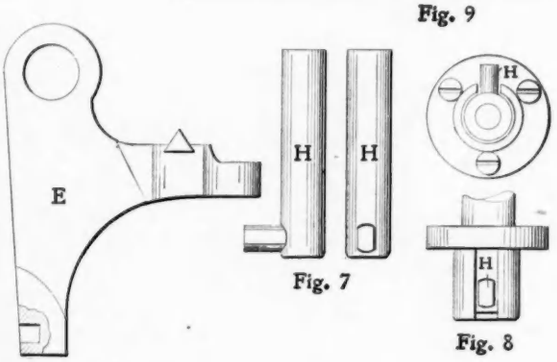


Fig. 6

Fig. 7

Fig. 8

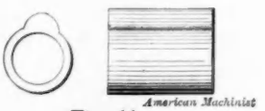


Fig. 11

DETAILS OF STAFF LATHE.

handle *d* work a clutch-bar *e*, which slides in a slot in *N*. When the machine is running this bar is engaged with the worm gear *f*. When it is required to turn the shaft *N* by hand, *g* and *d* are held by hand with the latter pressed in. This leaves the worm wheel loose on the shaft. When the hand is removed the spring *h* engages the clutch again; *g*, of course, is fastened to *N*.

Fig. 12 shows in detail the driving cone pulley, the worm wheel-box as screwed to the lathe and the method of tightening the worm to the shaft with screw, pin and plug from the center of shaft. The worm is not shown.

Fig. 13 shows the driving wheel for the work. One spindle is plain, with a hollow center for small pieces. The other, called a "whirl-spindle," is shown in the figure. The centers stand still. The pulley whirls

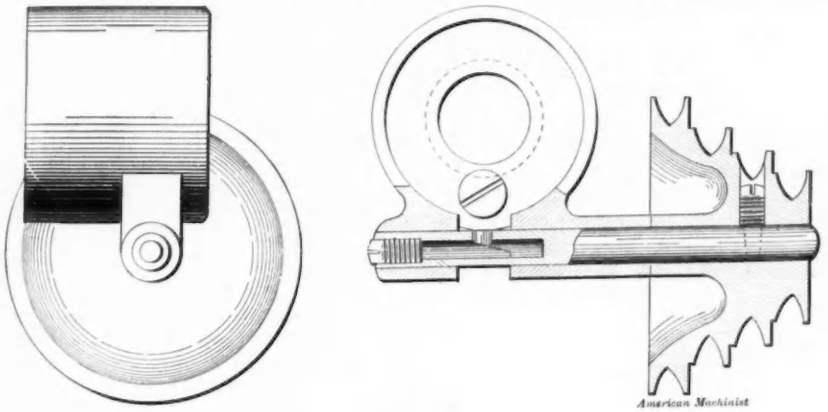


Fig. 12

DRIVING ARRANGEMENT FOR STAFF LATHE.

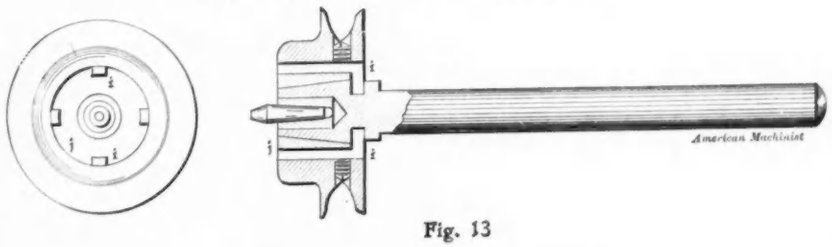


Fig. 13

WHIRL-SPINDLE FOR STAFF LATHE.

on the taper end of the spindle, which is hardened. The pulley has a hardened bushing *j*, with grooves in the rim. Two of these are seen with hardened steel hooks *i i*, which are held with set-screws in the pulley. They are placed to allow the free movement of the pulley, and as they wear, one can be moved out and the other in to take up lost motion endways.

The work is held by small clamps or dogs, a driving pin being held in one of the grooves in *j*. In some cases the hollow centers are drilled and countersunk, in others centered in a staking tool with a coarse and fine prick-punch, the sharp one making a sink for the center of the work to room in. While the machine is turning one piece, another is got ready.

The lathe takes work that has been roughed out in the small turret lathe, and makes it very true and smooth, on brass arbors especially. For taper arbors, upon which wheels or pinions are to be pressed to run dead true, such as register wheels in electric meters, etc., this machine is in order.

Brooklyn, N. Y.

Echoes From the Oil Country—V.

EXPERIENCE WITH A RUSTIC INVENTOR.

I had firmly made up my mind that I should always insist on enough information from a customer concerning a job to be able to avoid the trouble I had with Mr. Webster Daniells, but I soon found that it takes all sorts of people to make a world, and that a great many of them, at one time or another, find their way into a machine shop, and before Mr. Straze got through with me I found I had met another one,, and had added another jewel to my box of experience.

Mr. Straze was tall, elderly and rather good looking; looked like a successful farmer or storekeeper, I thought, as he came in and inquired if I was very busy, as he had a little work that he wanted done. "I hear you are a good mechanic and a square fellow, and I want you to do this yourself, as much depends on getting it just right, and I can tell you it isn't everyone I would let touch it," said he, as he unrolled a paper and took out a piece of ½-inch gas pipe, 15 inches long, and said: "I want this bored out true inside and turned off true outside; brighten it up very smooth so that there are no scratches in it; cut a thread in each end and screw a piece ½ inch long in one end and ¾ inch long in the other; put a ⅜-inch square hole through the ¾-inch piece, and leave the other end solid, and both faced off smooth. Can you do that?"

"Oh, yes, Mr. Straze; no trouble at all. What is this for?"

"Mr. Osborne, many a man has gotten himself into trouble by telling all his business to strangers, and I am too old to do that. I want this job done, and I am willing to pay for it. I am not a burglar or counterfeiter, and I think you are an honest man, but I don't want to tempt you too much. I won't get you into trouble for doing this unless you try to steal my ideas, and I don't intend to let you do that."

It slowly crept through my brain that this man was an inventor; perhaps had one of those great ideas in embryo that change the affairs of the world, and he wished to guard it, as, no doubt, he had heard how hard it is for an inventor to reap all the harvest that flows from his idea. I meekly explained that to work without knowing what I was making meant more expensive work, and I had $5 promptly handed to me and was told to go as far as that reached and more would be ready.

Mr. Straze left and I tackled the pipe. I took a piece of steel and flattened the end for 2 inches for a drill and took a scrape through the pipe, taking out the scale, then enlarged the drill and repeated, and found the hole looked rather poor for a gun barrel, but good enough for a popgun. I put it on the centers and took a light cut and found it bent out of shape. I sprung it back and found the hole crooked. I enlarged the drill slightly and ran it through and helped the hole some, but found the outside out again. Just then a bright idea struck me, and I straightened the outside and running it back into the hollow spindle, with the aid of a couple of nuts, caught it in the chuck and put an 18-pitch thread in each end. As the ends were to be plugged I would keep the outside true and trust the inside to luck, and after some trouble I got the plugs in and the outside burnished nicely, although I must confess that the last thing I did was to pry on it with a stick to straighten it. I had no idea that a piece of pipe would squirm into so many kinks just from a little work and a little heat.

When Mr. Straze came after the piece he seemed well pleased, and after wrapping it up asked me to make him a spring ⅝ inch diameter outside, ½ inch diameter inside, 15 inches long when open and that would push together so as not to be more than 7 inches long, and that would hold up one pound when not less than 13 inches long. I had some brass spring wire, and wasted a good bit of it trying to get the sizes and strength right, and finally got several that were pretty near, and my friend carried them away with him.

The next time he came back he wanted a piece of ⅜-inch square iron ground off slightly under size, "just a hair, you know," with a piece ¾x4x¼ inch fastened on one end—riveted—and a piece

⅝ inch round, ¾ inch long, screwed on to the other end, and a quarter twist put in between them. I mildly hinted that the $5 was beginning to look like 30 cents, and was promptly met with another $5 and told to go ahead, which I did. After this I made several mysterious pieces from pasteboard models. These were from sheet iron and bent into wierd shapes under the personal direction of Mr. Straze. A few small screws completed the job and we settled up.

Several days afterwards Mr. Straze came in again, carrying something very carefully wrapped up, and, approaching, asked me if he could see me privately for a few minutes. I took him into the office and closed the door. He then assured me that he had the greatest confidence in my integrity, and only asked that I would say nothing to any outsider and he would show me something that would be wanted all over the country, and he wanted figures on it showing what I would make them for by the thousand.

As he spoke he carefully unrolled his bundle and showed me the pieces I had made, all assembled, and I found that the square piece worked through the hole, with the round head inside and the spring around it. He had evidently put some more twist into the square piece and the corners had been filed off to allow the spring to go on, while it all showed some rather rough handling. He showed me, with evident delight, that by pulling the foot down about 6 inches it made a quarter turn and on letting go it returned to its place. Just one thing was lacking, and that was some way of keeping it down until wanted up, and that stuck him, and was evidently what induced him to show it to me. I suggested a latch held by a clip and a small part working through a hole, so the head would throw it out going down and it would catch behind the head and keep it down until tripped. This seemed to suit him, and an hour put it on, and the great invention stood ready for use.

"What was it?" you ask. Well, as the time is too far gone to get it patented, and my telling can do no harm, I will tell you. My friend was a storekeeper, and noticing how bicycle riders had to hunt a stone or tree or fence to lean their wheels against, or else lay them down, and in his leisure moments reading of the great fortunes that came to the inventors of printing ink, the ball with a rubber, the sewing machine, etc., and seeing this opening for himself, had gotten up an attachment for wheels, that weighed less than 2 pounds and could be attached to any wheel by various adjustable clips. You only had to set it the right hight when putting it on, and as you dismounted you pushed it down with your foot, and the foot set crossways of the wheel and would stay anywhere. On mounting, a slight kick released the latch and everything was out of the way.

As this was about the time that riders were beginning to leave off their mud guards, brakes, etc., and the various companies were trying to see which could make the lightest wheel without having it collapse under the first heavy weight that sat down on it, I did not spend much time on estimates on the cost of thousand lots, and when my opinion was demanded I modestly represented that I wasn't much of a rider myself, but strongly advised him to get some good rider to put it on and try it and give his opinion. This he consented to do, and departed. I have never seen it since, and when Mr. Straze meets me he never mentions it; but still, I somehow think he holds me in some way responsible that he is not now a millionaire. Now, how could I help it?

W. Osborne.

A Market for American Machinery in Greece.

Perhaps few American manufacturers have ever thought of the little Kingdom of Greece as an outlet for machinery. And yet the imports are not only quite considerable, but also increasing from year to year. The country is extremely rich in mineral resources, and during the last two years more mining concessions have been granted than ever before. The machinery at present in use is mostly antiquated, though a few mines got new mechanical outfits last year. The tools in use in the extensive emery mines of the country are especially crude.

In former years Greece was almost entirely dependent for its supply of flour from abroad. To-day, however, there are at the Piræus, the port of Athens, no less than sixteen well-equipped flour mills. The machinery for these mills came chiefly from Switzerland, Great Britain, Austria and Germany.

On several islands of the Greek possessions in the Mediterranean there exists an extensive soap and candle industry, the machinery for which was not supplied by the United States. There is every prospect of these two industries assuming still larger proportions, as raw material is available in large quantities.

There are also several beer breweries in the country which got their machinery from Germany.

Electricity is making steady progress. A large number of cities and towns will soon be lighted by electricity. The Athens & Piræus Railway Company must, according to conditions of its franchise, adopt electricity as the motive power for its trains within the next three years. This road extends from the quay in the Piræus to the business center of Athens, some five miles, three-fourths of a mile being through a tunnel under a portion of the city. A Belgian company, which owns and operates a steam tramway between Athens and the Piræus, via Phaleron, also wishes to adopt electric power.

Some time ago the Prime Minister of Greece, Mr. Theotokis, signed a convention with the representative of the syndicate of construction for the Oriental Railways for the building of a railroad to connect the Piræus and Thessaly, and to continue to the Turkish frontier. The railway will necessitate a loan of 43,750,000 francs ($8,299,000), which will be contracted by the government at 4 per cent.

Greece is also a great wine and olive oil producing country, and the demand for wine and oil presses is a considerable one.

Gas motors of all kinds are also in demand. The gas works of Athens and Piræus deliver gas to their customers for industrial purposes at very low rates.

Machine tool makers should pay a little more attention to the Greek market. There are two important engineering works in the Piræus, the principal one being controlled by a joint stock company known as the "Société Hellénique Basiliades." They are especially engaged in the construction of war and merchant vessels. Last year this company built the first locomotive ever constructed on the Balkan peninsula.

Another industry which is extensively carried on on the coast of Greece is that of sponge fishing. In 1899 the imports of machines and apparatus used in connection with this industry amounted in value to 3,500 francs.

The following figures, which are taken from the official Greek statistical returns for the year 1899, just published, give an idea of what is most in demand. The values of the principal machinery imports were: Pumps, fire engines, agricultural machines, 304,000 francs; power machinery, boilers, parts of machines, 463,000 francs, almost entirely from Germany, Great Britain and France; domestic machinery, 22,342 francs, chiefly from Germany and France; sewing machines, 167,453 francs, chiefly from Germany, Great Britain and Austria; machinery not especially enumerated, 256,435 francs. Electrical machinery occupies a special item in the returns, according to which the imports of electrical machines, apparatus and appliances amounted in value to 56,876 francs. In all these returns, however, are not included those machines which were imported for shipbuilding purposes. Neither are bicycles included in these items; they are classified, together with hand wagons, the combined imports of which amounted to 104,344 francs, chiefly from Germany, Great Britain and France.

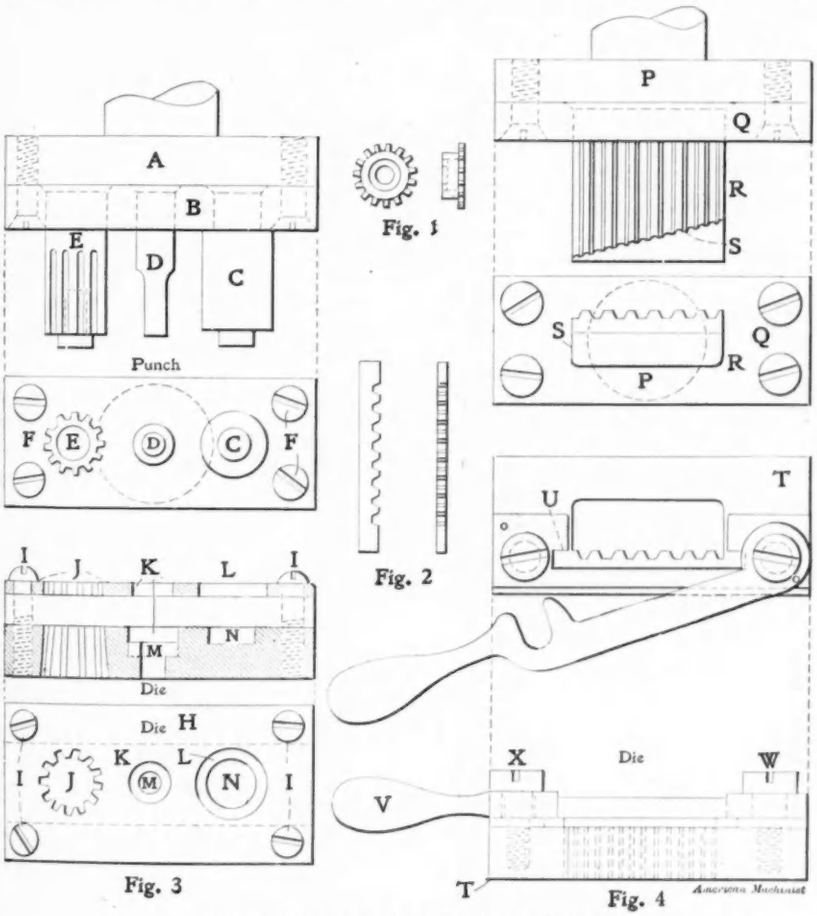
Our freight rates to Greece are low. At the rate of $6 almost everything can be shipped from this country to the Piræus. The commercial language of the country is French, and all printed matter and catalogs should be in that language, as it would be absolutely useless to try the Greek market by means of English catalogs.

H. L. G.

Making Gears and Racks by Punching.

BY JOSEPH V. WOODWORTH.

The pieces shown in Figs. 1 and 2 are a small brass gear and a rack, respectively. The gear was made of sheet brass, 5-64 inch thick, and was to be drawn to the shape shown, cupped ⅛ inch deep, with a ¼-inch hole punched in the center for the shaft. The drawn part was to serve as a case for a spring. The rack was made of sheet brass, 5-64 inch thick by 3-16 inch wide and 1⅝ inches long, blanked to the proper size. The pitch of the rack was to be the same as that of the gear, and they were to be used on a small automatic music box. They were both made and finished in the power press.



PUNCHES AND DIES FOR RACKS AND PINIONS.

Fig. 3 shows the punch and die, which were of the combination or gang type for making the gear. The die, which, of course, was made first, is shown in vertical section and in plan. In the first place, the die was laid out, and the drawing die *N* finished to the shape shown. Next the piercing die was worked out by counterboring down and letting in a tool-steel bushing *M*, hardened and ground to size. Then the blanking die was roughed out, and a piece of tool steel, turned to the proper size, and milled so as to form a perfect gear of the size required, after being hardened and drawn, was used as a broach and run through the die. The die was relieved with about 1 degree clearance, which is plenty for accurate work of this kind. The four holes for the stripper and gage-plate screws were then drilled and tapped, and the die, after being tempered, was finished.

The punch also is shown in two views. *A* is the punch holder of cast iron, *B* the pad of 7-16 inch machine steel, *C* the drawing punch, *D* the piercing punch, and E the blanking punch; all, of course, of tool steel, worked out, finished and hardened, let into the pad, and upset in the back as shown. The pad was fastened and held to the holder by the four flat-head screws *F*. The stripper and gage plates for the die were then got out, and after being finished and placed in position the die was ready for work. A strip of soft sheet brass, 5-64 inch thick and of the proper width, was inserted in the die just far enough to do the drawing, and the punch descending, the piercing and blanking punches entering the die (before the drawing punch started to work) to steady it and hold it rigid while drawing. For the next stroke of the press the work was pushed forward one space, the recess at *M* acting as a gage. The ¼-inch hole was pierced, and the next or third stroke completed the operation, by the pilot entering the work and the last punch blanking and finishing. After that a gear was finished at every stroke. As will be seen, in a job of this kind the metal has to stretch lengthwise and draw sidewise; but this was no hindrance, as the work produced was very satisfactory.

Fig. 4 shows the punch and die for making the rack. In this case the punch was made first. *P* is the holder, *Q* the pad, of machine steel, and *R* the punch, which worked on the shearing principle. The punch R, after being milled to the correct shape, size and pitch, was sheared away as shown back ¼ inch from the face, leaving the back square and flat. This was done to allow the punch to enter the die before it began to cut the work. It was also left heavier than necessary in order to strengthen it. After being hardened and drawn, it was let into the pad, upset or riveted at the back, and the parts assembled; this completed the punch.

The die is shown in two views below the punch. It consists of the die proper *T*, which, after being roughed out, was broached out by the punch. The screw holes were then let in, and it was carefully hardened and tempered. *U* is the gage plate, which was worked out so as to just accommodate the blank, leaving it projecting on the tooth side about .002. *V* was the lock or binding strap, which swung on the shoulder screw *W*. After the blank was placed within the gage plate *U*, the binding strap *V* was swung and hooked on to screw *X*, causing the blank to be held flat and firm while the punch descended, shearing and cutting, gradually thereby producing a rack with good, clean teeth of the proper shape, and leaving no burs.

This proved to be a very rapid way of doing them, the die being easy to set up and also easy to operate. Making the punch shearing caused it to cut gradually; in fact, if the punch had been left straight, the result would have been different. Instead of the teeth being flat or nearly square at the edge, they would have come out half-round and ragged. This principle I have found to give very good results in a large variety of work where the edge is desired to be anywhere near square, and where the stock which is worked is anything over 1-16 inch thick. I have often seen a lot of small work of this kind being done in the milling machine when it could have been done in the power press with better results and at not more than one-tenth the cost. The trouble is, they are afraid to try; and will never believe a thing possible until they see someone else going ahead and doing it.

A serious accident occurred at the plant of the New York Steam Company on August 13, by which three men were killed at once and several others severely scalded. A flange of a new cast-iron elbow in a 15-inch steam pipe gave out with steam at 90 pounds, filling the entire building, in which were some seventy-five employees, many of whom escaped with difficulty.

Letters from Practical Men

Micrometer Caliper for Measuring the Radius of Spindle Drills, and Similar Pieces Impossible to Measure Directly.

Editor American Machinist:

The principle of the gage is shown in the sketch, Fig. 1. As we have a constant angle of $\frac{130}{2} = 65$ degrees, the line l will always be in a fixed ratio with the correct radius of the piece to be measured. So we have only to multiply the radius of the piece to be measured by the constant 1.103 and set the gage to this amount. The constant is found by the reckoning:

$$l = \frac{r}{\cos. 25^\circ} = \frac{1}{0.90631} = 1.103.$$

To set the caliper to zero it is necessary to have a measuring disk, say 10 m/m diameter, then we reckon the distance l, Fig. 1, for this disk as follows: $5 \times 1.103 = 5.515$, and add to this $r = 5$, giving 10.515. To this amount we set our screw, and then put the disk between the point of the screw and the anvil and tighten the anvil when the gage is ready for measuring any diameter up to 20 m/m radius. For larger diameter we make the same arrangement with a measuring disk 30 m/m diameter, and are then able to measure the radius of pieces up to 60 m/m diameter.

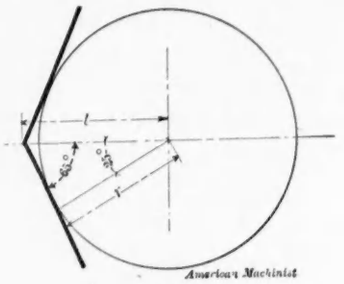


Fig. 1

THE PRINCIPLE OF THE CALIPER.

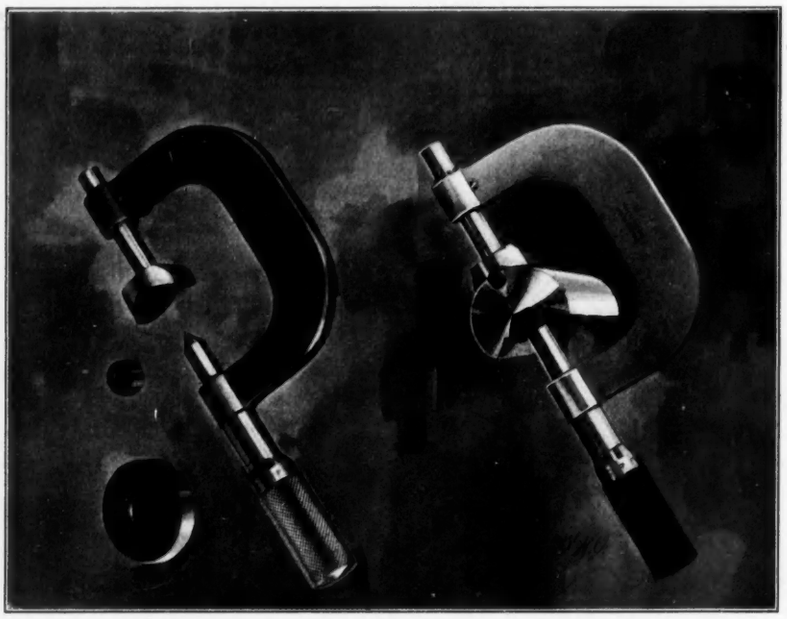
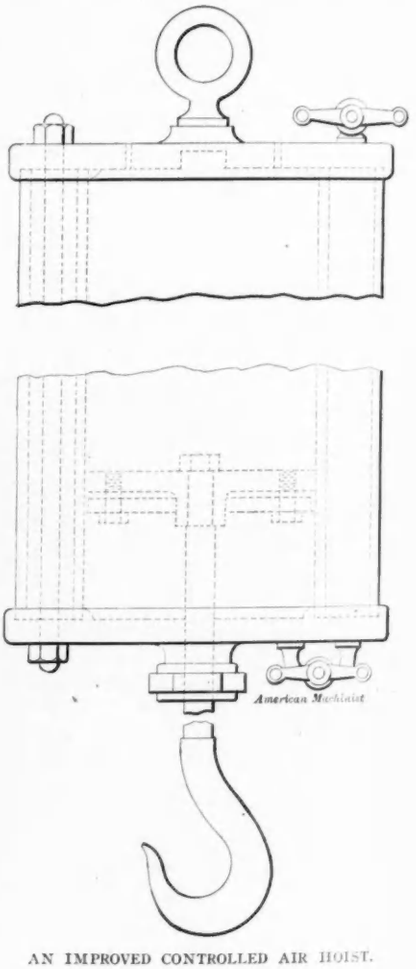


FIG. 3. THE CALIPER WITH MEASURING DISKS.



AN IMPROVED CONTROLLED AIR HOIST.

This gage is especially valuable in milling to the center of things where the periphery is interrupted, as in spindle drills, etc., a section of which is shown, Fig. 2.

Example.—To state the center of a piece 19.5 diameter, we set the gage according to the first case and reckon: 9.75×1.103 = amount we ought to read on the micrometer scale when the center has been reached. Fig. 3 shows the instrument with the measuring disks.

Berlin, Germany. OTTO ECHETT.

[If we might venture a suggestion, it would be to make the anvil with a slightly different angle such as to make the constant multiplier 1.1, and thus facilitate the calculation.—Ed.]

An Improved Controlled Air Hoist.

Editor American Machinist:

That controlled air hoist, shown by Mr. Dunbar in No. 30 of the "American Machinist," is self-evidently a good thing where it is desirable, as it often is, to secure absolute steadiness in the movement of the load, and where it is also necessary to move slowly, as in raising a flask or drawing a pattern, or to move minute distances, as sometimes in punching boiler work. I would like to venture, however, to suggest that the additional vertical hight required by Mr. Dunbar's arrangement must be more or less objectionable, and I submit herewith a little different combination embodying the same idea as that of Mr. Dunbar, accomplishing all that it does, if not a trifle more, and requiring no additional hight over that of the simple, direct-acting hoist.

The sketch, I hope, will explain itself. there are two cylinders, one within the other, the inner cylinder having all the functions of the regular air hoist, and the space between the inner and the outer cylinder forming a chamber for the oil. The sketch is drawn to about the correct relative proportions. If the hoisting cylinder was 6 inches in diameter and ¼ inch thick, and the outer cylinder was 9 inches internal diameter, the oil space would be a little more than would be required. The cylinders are supposed to be both faced exactly to the same length, and the surfaces against which they abut in the heads also to be faced true, then with a little thin packing and the bolts, one of which is shown, running longitudinally through the oil space, the cylinders and the heads are held together solidly and securely. The hoisting pressure is applied through the upper valve first to the oil in the chamber, and by means of the oil to the hoisting piston. The air hose is of course connected to the upper valve in some way which it was not necessary to indicate in the sketch. The connection between the oil chamber and the hoisting cylinder is through the lower valve. With this valve open, the hoist may be operated by the

upper valve alone, as with the hoist in common use. The space below the hoisting piston is always filled with oil, and the space above the piston is in free communication with the atmosphere through the holes *a a*. With the oil above the piston, as shown by Mr. Dunbar, with my experience with cup leather packing, I should expect that when no air pressure was on, the oil would leak quite rapidly down past the piston. The oil below the piston must always operate to distend the leather lip and make it hug the cylinder surface. The lower valve should be adjusted to move with more or less friction, so that it would remain in any position at which it was set, and then it could be adjusted for slow hoisting and lowering. With the full air pressure upon the oil, the hoisting could be controlled entirely by the lower valve, as explained by Mr. Dunbar, and with the air pressure released above the oil the lowering also could be controlled by the lower valve. If, when the piston was at the bottom of the cylinder, the air chamber was entirely filled with oil, there would be no unfilled clearance space, and the hoisting might begin without any waste of air, which could not be done with the hoist in common use, nor, indeed, with that shown by Mr. Dunbar. There must of course be provided a valve at the top, not shown, for filling the oil chamber.

MORRIS FULTON.

Philadelphia.

The Automobile.

Editor American Machinist:

Perhaps you have noted a diversity of opinion as to the proper name to be given to a self-propelled road vehicle. You have heard it called autocar, autobain, motor car, motor carriage and automobile, but I think that about the most expressive term I have heard yet was used by my wife the other morning, when she gave me a knowing, sidewise glance and remarked, "Robert, I guess they made you steer the automobilly-goat last night; didn't they?" I couldn't say a word.

R. G. P.

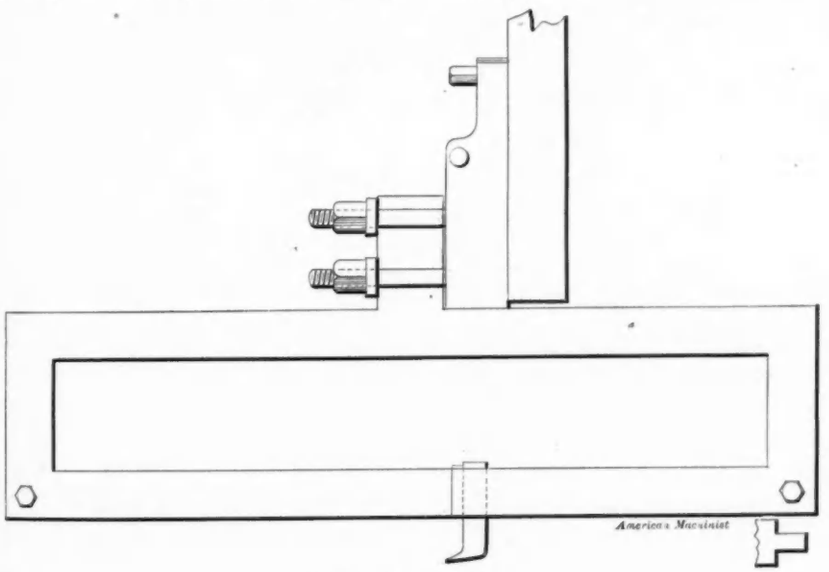
An Inside Planer Tool.

Editor American Machinist:

Here is a sketch of a tool for a planer that may interest some of the craft. Having had a job to plane out a hole in the main driving gear for a traveling crane, the hole being 16 inches long, cored out 2½ inches square, to be planed 3 inches square, I made a frame out of 1½-inch square machine steel. Sketch will explain the rest. I infer it would make a splendid key-seating tool in the absence of a machine for the purpose. We did not have a slotter.

CHAS. HEENA.

Findlay, Ohio.



INSIDE PLANER TOOL.

Storage Battery Spark Ignition.

Editor American Machinist:

While reading the very interesting article in No. 32 of your valuable journal, by Hugh Dolnar, entitled "A Storage Battery Spark Ignition," I notice he makes the mistake that quite a number of writers make when writing on the internal-combustion engine, that of not figuring the right number of ignitions or sparks required per minute. He speaks of a De Rochas or Otto cycle engine, running at from 500 to 2,000 revolutions per minute, requiring from 125 to 500 ignitions per minute, while it is just twice that number, or 250 to 1,000 ignitions. He divides the number of revolutions of his engine by 4, while he should divide them by 2 for the Bran De Rochas or Otto cycle, this type requiring an ignition every two revolutions of the crank shaft; he perhaps confounding four cycle with four revolutions, this being the common impression with a great many people. I remember being present at the installation and starting of a gas engine in our town, when I stepped up to the agent, who was, by the way, a machinist as well, and asked him if the engine was a four-cycle, when he answered, "Yes; she explodes every fourth revolution," when in reality it was one of the Otto cycle design.

And for Mr. Dolnar's six-cylinder road wagon motor, if it operates on the De Rochas or Otto cycle and runs at from 500 to 2,000 revolutions per minute, it will require 1,500 to 6,000 sparks or ignitions per minute, viz.: $6 \times$ revolutions $\div 2$, which cannot be accomplished successfully by any spark coil within the writer's knowledge; having found, while experimenting and trying to obtain 3,000 successful ignitions per minute, that after 600 makes-and-breaks per minute were obtained and from that to 800 per minute, they became feeble and were not hot enough to ignite successfully every charge, and with increased speed it still diminished, diminishing in brilliancy in about the same ratio as the increase of speed.

It was by chance I first located my difficulty. I had my spark coil, which was a standard, lying on a shelf on which were lying a dozen or so nails. While I was running the engine my attention was attracted by a noise on the shelf, and on looking I discovered the nails were dancing to the time of the makes and breaks of my sparker. I increased my speed, until at 1,200 makes-and-breaks per minute the dancing was nearly *nil*. Anyone can study this very interesting phenomenon who uses a coil, by taking a piece of iron wire and bending a hook or ring on one end and hanging it on the finger and holding it near the spark coil while running; and if you can increase the number of makes-and-breaks, you can discover at what speed your coil is capable of becoming magnetized and demagnetized.

This question of ignition is the "bogie man" of the gas-engine industry, and when he is mastered, this economical yet vaguely understood motor will take its much deserved place in the power field. It is surprising the small amount of knowledge obtainable from electrical engineers regarding the speed at which the spark coil "lays down," and successful ignition at high speed can only be obtained, in the writer's opinion, by a duplication of coils, etc., when upwards of 800 makes-and-breaks per minute are required.

Some may say I did not use the right sort of batteries to obtain high rates of ignition, but I have used the best batteries (and enough of them) and the best generators the market affords.

FRED C. TYGARD.

Pittsburgh, Pa.

An Auxiliary Hand Feed for the Shaping Machine.

Editor American Machinist:

The remarks by Sachem Parks, in issue No. 31, regarding positions assumed in operating shapers, merits an answer, particularly as his query may seem quite pertinent to many other readers.

Mr. Parks asks why the vertical feed could not be operated by the left hand and the horizontal with the right. Why, bless you, we can and do, when we are plowing the humps off castings or roughing out metal within a mile or so of the line. Now, I particularly stated that the position, Fig. 1, was necessary when planing to a line, and want to prove it.

Suppose we have an irregular shaped punch or die in the shaper vise, with a fine line to work to; we understand, of course, that a minimum amount of filing is essential, also that oil grooves are a superfluity. Good light is necessary for this job—in fact, shapers are generally placed where the light is good. Now, take hold of the vertical feed with your left hand, and then see what you can see. I think we'll find that the left arm effectually blocks the light. Now for a job like this we generally want the eye somewhere near the plane of the tool or cutting motion; so duck your head so as to bring the line within your range of vision, and then you will be competent to judge which position is preferable, or, as Tecumseh Swift would say, most conducive to a proper maintenance of dignity.

Now, it may be that Mr. Parks is one of a numerous class who never had the good (or mis-) fortune to be given such a job, and therefore never had to assume either of the positions, for which he ought to be truly thankful. There are undoubtedly many readers to whom this position, Fig. 1, issue No. 28, is quite familiar, especially where any quantity of stamping dies are made. This is one of the jobs which is very trying to the nerves of the toolmaker, if he happens to have any left, as the least bit too deep generally means a spoiled job.

The shaper is essentially a tool for machining intricate surfaces, and the first requirement is that the work and lines be in plain sight while the feeds are in full control of the operator. The convenience with which the feeds can be manipulated then largely regulates the output of the machine, to say nothing of preserving the temper of the operator. G. J. M.

What are Foundry Improvements?*

BY P. R. RAMP.

Many articles have been published referring to improvements in the foundry; our mechanical papers are well supplied with illustrations and descriptions of improved materials and appliances. With so much of the product of man's genius at our command it seems incredible that we have not reached perfection.

When we look around us and see the many devices invented to save labor and time, we wonder what would be an improvement in our shop, because we must realize that what would be an improvement in one shop would be a failure in another; that is to say, it would not be a paying investment to erect a 25-ton traveling crane in a shop making 2-ton castings.

The first improvement required is a practical mechanic as manager, one who is capable of making improvements and seeing that proper results are obtained. For a man not familiar with the trade in detail is often led to believe that the molding machine he has recently purchased is not a success, and if it is allowed to stand idle so much money is thrown away. On the other hand, the practical man takes hold of the same machine, and if it can be operated successfully and his men do not succeed at it, he will enlighten them.

This instance not only applies to molding machines, but to any improvement put into a foundry. A man like this does not depend upon the ability of the men under him, but is governed by his mechanical experience, proving him a master of his business; he is competent to develop, or, in other words, make men by giving them practical instructions in the trade.

Considerable improvement can be made in the method of making and using the flasks in many shops. The practice of compelling molders to use old flasks, with the joints badly burnt, in order to save lumber, is not a principle of economy; one who does so generally has to pay for it. A few hundred feet of lumber will often save many thousands of pounds of castings from the scrap-heap; that is, from the time a job is put in the sand until the order is filled, the loss in bad castings will often be 50 per cent. greater than when the molder has a good flask. A good flask and a pattern properly constructed will not only make it impossible for the molder to blame the flask for any carelessness on his part, but will make it possible for one with less experience or a cheaper man to do the same work. So we see a good flask is as essential in molding as a good pattern. Strong, well-made flasks cheapen the product by reducing the loss in bad castings and increasing the output often to a very gratifying extent.

It is poor policy to patch up a flask. If you have an order for ten castings and the profit on the first one will pay for the material to build a new flask, build it. You may lose one-tenth of the profit, but you are liable to lose more than a tenth while using the patched-up affair. Temporary makeshifts are dangerous and often expensive. In a shop where there are many standard jobs and the work is heavy, as in railroad, machinery, etc., my experience has shown it is much cheaper to make iron flasks. Then the shop should be equipped with a good trolley system, a trolley track over each floor. The flasks that are too heavy to lift by hand should be handled with an air hoist suspended from the trolley. Such flasks must have trunnions cast on them, so that with the aid of a bail the molder will be relieved from all heavy lifts. Iron flasks cannot burn out at the joints. When they become obsolete they may be broken up and remelted, whereas in case of wooden flasks they are of no further value.

Considerable time might be occupied in discussion of this subject, but in summary will say, strong, substantial and practical foundry equipment, in charge of one thoroughly versed in the same, cannot fail to come under the head of improvements.

* A recent paper of the American Foundrymen's Association.

A Recent Patent for a Belt Dressing

The following is the specification of a recently issued patent for a belt dressing:

"My composition consists of the following ingredients, combined in the manner and in the proportions stated, viz.: pure tallow, 20 pounds; pure lard, 40 pounds; common salt, 10 pounds; sugar, 10 pounds; rosin, 20 pounds; water, 40 pounds—or in weights of each of like proportion to the combined weight of all the said ingredients.

"In preparing the composition the tallow and the lard are to be melted together in a vessel. The salt and sugar are thoroughly dissolved together in the water, preferably heated, and the solution is then added to the melted tallow and lard, at the same time adding the rosin. The whole is then allowed to boil for 1½ hours. When cooked sufficiently, the water is all boiled out and the composition becomes a froth or foam. It is then allowed to cool, and when cool is ready for use. In cooling a sediment amounting to about 3 per cent. of the entire original ingredients (excepting water) settles to the bottom of the vessel, from which the composition is carefully separated when cooled.

"The above-named composition is best applied to a belt while it is running, whereby it is more evenly distributed over the belt.

"By the use of the above composition the adhesion of the belt is greatly increased and prevents the belt from slipping under all circumstances, thereby saving power. Furthermore, it makes the belt soft and pliable, renders it waterproof and increases the life of the belt. Furthermore, it protects the belt when exposed to steam or acids. Furthermore, it removes foreign matter or dirt from the belt. Furthermore, it requires only a small quantity to have the desired effect, thereby rendering its use economical, and, finally, it allows the belt to run slack, thereby preventing the heating of journals, while the machinery will retain the required speed."

This may or may not be good stuff for a belt. Some one or other of the ingredients should make a hit. The following is the entire "claim" of the patent, and it seems to make the document utterly worthless, for of course the slightest departure from the schedule of ingredients would evade it:

"What I claim, and desire to secure by letters patent of the United States is: The

composition herein described, prepared as herein set forth, from tallow, lard, sugar, salt, rosin and water, combined in the proportions stated, for the purpose specified."

For Trained Metallurgists in the Foundry.

At the recent Chicago meeting of the American Foundrymen's Association an interesting discussion was had upon the above topic, based upon papers by Dr. Kirk, Mr. West and Prof. Richards. It is not necessary here to give the gist of it, but we make room for a few isolated paragraphs, which will be found interesting in themselves:

MR. WEST.

One objection in dividing the responsibility for final results in making castings lies in the fact that a molder or foreman can by design, ignorance or carelessness, make castings possessing varying qualities from the same patterns, and poured from the same ladle of iron. To locate the responsibility for such varying results throughout a shop's "heat," when the same mixture had been used would, to say nothing about the losses incurred, be very embarrassing to a general manager or president of a company who recognized the importance of maintaining internal harmony.

Another objection in dividing responsibility for results in castings lies in the fact that such procedure would unfit men to be masters of founding, and decrease their ability to comprehend its difficulties and the skill required. It would cause many to think that anyone having a few dollars to start a foundry could operate it successfully. As an illustration of the evils resulting from the inability to comprehend the difficulties involved and skill required in founding, I will cite a case which occurred recently not far from our foundry, and others can, no doubt, cite similar instances of doing an injury to the trade. This particular case was that of a blast furnace chemist renting a foundry in the vicinity of his laboratory, and hiring a farmer, a relation of his, to manage his foundry. This chemist evidently thought that all the science of founding lay in the cupola, and understanding analyses to make mixtures of iron. He thought, with the assistance of his farmer relative, that they both could run the foundry and make money, without his leaving his regular occupation. This "would-be" foundryman remained in business about six months, when he failed, having lost all his money and much of that belonging to those who had allowed him credit for fuel, iron, etc. If this man had done no other injury than losing his own money and that of his creditors, it would not have been so deplorable, but his ignorance of the difficulties and skill required in molding to make castings caused him to make prices that took the work away from old, experienced and successful founders. The evils of such incompetent management can be readily discerned, being most grievous, and deserving condemnation wherever found. To guard against this unintelligent competition we should oppose any measures that tend to only partially educate men in the difficulties and skill required in founding, and the broader we can make such an education the better for all concerned.

* * * * * *

Steel is not used because of the degeneration of cast iron, but because it possesses peculiar physical qualities not to be found in cast iron, which make it best fitted to fulfill certain conditions, similarly as we find it necessary to use malleable or brass castings, etc., to take the place of cast iron. There will always be a good field for cast iron, and none need fear its going out of use, as alarmists would have us believe.

* * * * * *

I doubt if the day will ever come when a man can decide by analysis, without seeing and feeling his molding sands (as can be done with irons), whether sands are suitable for the varying conditions required in making castings. The molder foundrymen want to see and handle their sands, and only by experience in actual founding can anyone tell the grades of sand best suited for different classes of castings. With blackings or facings, the only test is to use them.

It will be noticed that I have used the term molder foundryman in this discussion. Some years back we rarely, if ever, had foundrymen who were not practical molders, able to make good castings from any patterns or sweeps that might enter their foundries, while to-day we have about as many founders incapable of doing this as there are those who can, hence I have adopted the term "molder foundryman" to show the distinction.

MR. BELL.

I suppose there is no mechanical trade that is so entirely dependent upon the judgment of the operator as the foundry business. I think every foundryman who has had any experience practically in the management of a foundry will agree with me upon that point. You might just as well attempt to make an athlete from book learning as to make a practical founder from a mechanical education. There must something else go with it. I would not for a moment dispute the value of a chemst in a foundry. Unfortunately, in my day it was not available. We had to learn what we did learn about the foundry business from experience. We went through it from the foundation up; and whatever success has been obtained by old foundrymen has been by the exercise of that quality—good judgment, ability to decide questions practically from facts that have come within his observation. Now, I think a college education is a good thing for the minister and for the lawyer and various other callings in life, and so it is valuable to the foundryman; but, your classical education is not going to make an attorney of anybody, nor is it going to make a good minister of anybody; it takes something more. That is what I am trying to get at; it lacks something more, and that "more" depends, first, upon the individual. He must have a genius for it—for the exercise of judgment upon a trade that is so largely dependent upon good judgment. Now, there are some young men—boys—coming up that you might educate in the highest branches and give them all the facilities, and they would never make foundrymen; they want to go by rule. "The books say so." I knew a doctor once who was very highly educated in the books, but when it came to practical affairs he seemed to be a child, and he is a child to-day. He is still in his books. He is still in the alphabet. He knows what is in the books just as well as anybody does, and he knows it thoroughly, and can put his finger upon it, but when it comes to a practical case of sickness, he don't seem to be able to get all these things together that are necessary to success.

Now, I mean only this, that the practical foundryman is benefited by any learning that he can get together from books and chemists and from every source, but all these things together without the genius of founding are vain and lost.

DR. MOLDENKE.

You take a good college man and put him in the foundry, and he will only have success if he has the genius to grasp it. I may feel a little flattered that I have succeeded a little bit. When I went into the foundry my employer told me he would give me five years to accomplish a certain result. I accomplished it in three, and have saved that foundry an enormous sum as a consequence. The point is this—more young men are coming forward every year. If under the old way it took ten or fifteen years to obtain experience in the founding, we want the young men to pass over half of this time by a proper education in foundry matters. It means time saved, and time is money. It is the young man of to-day who has got to push matters, and the chances are that our sons are the ones who will do it. We want to see our sons in the foundry some day, and what is better than to equip them as well as we can before they start?

MAJOR M'DOWELL.

I commenced originally not as a foundryman at all, but drifted into it merely by accident. After getting there, however, I went to the bottom of it, and was not satisfied until I had a complete laboratory and a good chemist back of me. I then saw the great many questions that came up, and I presented to our foundrymen's association some papers on the value of metalloids with iron, and I proposed a series of experiments to demonstrate what this metalloid or this metal in combination

with iron would do—what kind of a casting it would make—what the value of it was—to establish some principles of the kind as you do in establishing standard test bars. Instead of buying iron as you do you would buy it intelligently, because you know the combinations of the different metals and metalloids, giving the qualities you want. The large works I went to were in New England—among the largest in the United States. They carried an immense stock of all kinds of iron. Experiments were made on the various lots of scrap iron, until we knew the value of the metalloids in the piles of iron. Back of this was the laboratory—this college-bred young man—who made a perfect analysis of the iron and understood it thoroughly. They were able to make a variety of castings from ⅝ inch thick upward. What you want to know is what it takes to make a casting. You want to know that you have the material to make it, and know what it is that makes it. Now it is utterly impossible to do that without a chemical analysis.

Another "Terror of the Seas."

The daily press is telling now about a "mysterious" craft being built on an island near Stamford, Conn. It was recently launched in the night. "The island is guarded. Fierce mastiffs protect the shores. If a boat approaches too near it is fired upon.

"The boat is 50 feet over all, has a beam of 8 feet, and looks like a great wooden cigar. The shell is of yellow pine, with two coatings of ship felt tar over it, and above that galvanized iron, ½ inch thick. A rim of solid wood marks the prow. It is faced with a solid iron plug, tapering to a sharp point. The deck is 24 feet long, and in the center of it is a conning tower, 4 feet high and 2 feet in diameter. In the tower are three lookouts of heavy glass and two torpedo ports. There is a rudder with the rudder post fixed to the main keel, and there are two bilge keels. Two keels almost on the water line are fitted with fins intended to raise or sink the boat. Propulsion is obtained on the 'squirt boat' plan. Water is taken toward the stern and forced out with pumps, driven by two engines, each of 1,000 horse-power. The engines run by electricity. Kerosene oil is the fuel. It is stored in tanks holding fifty-five barrels. The remarkable destroyer for which so much is hoped weighs about 3,500 pounds and will carry a crew of three men. The expense of building the vessel has been enormous. Carter has spent money without stint. He said that all he wanted was success. The cost did not count.

"The workmen, of course, cannot be prevented by the detectives from talking. They say that Carter this week announced that the boat was a triumph, and that she could go out into the ocean and destroy an enemy's fleet, one boat at a time, practically without risk to herself. 'I expect orders to build a fleet of these terrors,' he added. 'They will revolutionize naval tactics.' "

The Life of an Immigrant Iron Worker in the Fifties.

A strong light is thrown upon the condition of the iron industries and of the men employed in them here half a century ago by some letters that have fallen into our hands recently that were written by an English iron worker to his mother, who remained in England. The first of these letters is dated December 27, 1852, from a small town in New Jersey, and we extract from it as follows:

DEAR MOTHER:

We received your letter, which you sent us last February, and was very happy to hear from you, but was not satisfied with having no more information of J—— and H——. We are in the same place now that we were when you received the last letter from us, but not in the same house. We are in a frame house with trees round it and a garden in front. The house has two bedrooms upstairs and one down, and a kitchen and pantry well stocked with plenty to eat and drink, and no fear of want. We have four pairs of bedsteads and beds and bedclothes to them. We have one dozen of chairs and a rocking chair, a table, a bureau, half a dozen three-legged stools and two benches. We had out of the garden about fifteen bushels of potatoes, a great quantity of kidney beans and peas, a quantity of sweet corn, a lot of pumpkins, beets, citrons, melons, squashes, parsnips, carrots, etc. We had about two bushels of cucumbers off a piece of ground 5 feet long and 4 feet broad. Apples, rabbits and fish we have for catching and fetching. The land around is mountainous and rocky—uncultivated. There are some farms, but not well cultivated. George and Samuel were on the mountains last winter, up to their knees in snow, sawing logs, and the cold was very severe. George had two of his fingers frostbitten. Last winter was the coldest winter that has been known in the States, the thermometer standing at 17 below zero. The summers are hot, but we do not feel it so much this summer as when we landed. We have been troubled a little here with the mosquitos, but not so much that we were at Jersey City. The work has gone on very badly since we have been here. About the time we came the manager went to California and the master left the village, so that the place has been badly managed or not managed at all, but the master is coming to live with us again and see to the business himself. It used to be one of the best places a man could work at, and a man could have money at any time he wanted it, whether he had it coming or not, but since we have been here there has been a great deal of money laid out for no useful purpose, and no iron scarcely sent to market, so that men could not get money like they used to do; but very few have any coming in consequence of doing little work and having the store to run to for everything they want; for whether they have it coming or not there is nothing denied them at the store. We have started the mill nearly six months and have been trying to heat the blooms with the escape heat from two of the forge fires, but have not made much of it as yet; the fact is, they have not given it a fair trial. The master was persuaded that no one else could deal with the furnace but someone that had worked at such a furnace, therefore the man that built the furnace took to the heating and employed an Irishman to heat for him by the day; but, Oh! I will leave Joseph to guess what excellent work they made of it. The master wants George to take to the mill altogether and get the iron up at so much per ton, but the man that has the heating has taken it until the first of April, but having another situation to go to, wants to give up his claim to me, on certain conditions, after seeing that he cannot get anything by it. We have been doing nothing this month on account of the hot air pipes being burnt through. We expect to make a beginning some time this week, and George expects to carry the mill on himself when it starts again. At present George has it all but the heating, and Samuel is catching and Ben heaving up, and the mill goes on only in one turn. Now, the master says he wants it to go night and day and do as much work as possible, for the iron fetches a good price, and he can have plenty of orders and supply us with the iron so as to keep the mill going. George will have the heating in April, if not when the mill starts again, and George wants Joseph C—— to come and roll with him, if he feels disposed to come. If Joseph makes up his mind to lead a sober and industrious life, we have no hesitation in saying that he will do well by coming to the States, but if, on the contrary, he thinks when he gets here, like a great many, that he has nothing to do but eat and drink until they have lost their senses and sometimes their life, he had better not come, for it will be jumping out of the frying pan into the fire. There is a society formed in our village called the Sons of Temperance, also one at Boonton Iron Works, ten miles off, where there are a many Englishmen. Spirits are very cheap here, and when a man gets into the habit of drinking them, and his stomach so disordered that he cannot do without them, he is ruined. There are often cases of people dying in the States of intoxication. There was a case this week of a man being found dead with a bottle of rum in his pocket a short distance from our village.

In our village no spirits are sold or allowed to be brought on the premises, except in case of sickness. There are all kinds of fruit, so that Harriot could make

what wine she liked. Marina and Sarah have made this summer five or six barrels of wine, besides bottles full, as well as jam, as the fruit we can gather ourselves. The people live different here; they set their tables like the gentlemen's in England, with all kinds of variety three times a day. George wants Joseph to go to William W——, New Village, near Bilstone, and enquire for John S——. George wants John S—— to come and heat for him. S—— promised George that he would come if he sent for him. If Harriot brings a good girl with her, one that is used to housework and honest, she can soon have a place and get from 5 to 6 English shillings per week and her board. Girls are more independent than their mistresses. If Joseph makes up his mind to come he must get everything ready and then start altogether for Mr. Howells, Grape Inn, 29 Union street, Liverpool. Harriot must bring her bed and bedclothes, knives and forks and what china she has. She had better bring with her a pot and tea kettle and what she will want to eat out of and with. She must calculate to bring five weeks' provision at the least with her; bring an ham from home—the rest she will get at Liverpool as cheap as at home. There will be enough allowed you by the vessel, but it will be such that you cannot live upon; but a many have nothing else. There will be some things that you can do with, but not all, and Mr. Howells will tell you what you will want, and you must exercise your own judgment a little, because Mr. Howells will not know what you like and what you do not. Do not stop in Liverpool no longer than you can help, and while there mind your own business and look after your things. When you know what vessel you are coming in, write a letter to us and we shall have it time enough to know what time you start from Liverpool and by what ship, so that we can meet you at New York or appoint someone else to do so and forward you on to us. If Joseph does not come, we hope he will tell Skidmore to bring a steady man with him to roll. Ours is a 16-inch train. The master has an idea of putting down a small train to roll small iron. If no one should be aware of your coming into New York, enquire for Mr. Edwards, at —— Whitehall street, opposite the Battery, and ask him to forward you immediately to Rockaway, in Morris County, New Jersey. When you get there enquire for Mr. Mott and he will give you directions how to come here by wagon. It is 11 miles from Rockaway to C——. * * *

The other letter is written from the same place and dated February 4, 1856. Things had not been going quite so well in the interval, as shown by the following:

"We have worked in the mill but about two days in nine months. When the mill stopped, I and Sam had a good deal coming, but could get no money; but since we stopped we have been living on some of our money from the store. In the fall Sam went to puddle at Boonton, about 10 miles from here, and Ben works with him. Sam is getting about 11 or 12 shillings per day, or $2¾, and Ben 5 shillings, or $1¼, and they get their pay every month, in cash. George has not moved and wants to see whether the mill will do anything this spring. If the mill is likely to go on good, Samuel will come back, as he can do better. Since the mill has been idle, George has traveled round to several works, but could not meet with a job to better himself, so as to pay him to move his family. He was in Pennsylvania State nearly one month and stopped at a place called Danville, where he worked odd turns, and the master wanted him to take to the rolling of the puddled iron at two trains of rolls by the ton, but they could not agree upon price."

Municipal and Private Ownership.

There has just been published at Washington the fourteenth annual report of the Commissioner of Labor, Carroll D. Wright, for 1899, containing an investigation of the finances and practical results of water works, gas works and electric lighting plants in the United States as operated under private or municipal ownership or control. A great quantity of statistics has been amassed and tabulated, although the data are not assumed to be complete. The facts classified do not conclusively settle the merits of the two systems of control, but they are strongly indicative upon certain points. It is shown that under the most favorable conditions and best management, gas can be produced at a figure as low as 20 cents per 1,000 cubic feet, not including depreciation, interest, taxes and leakage, and including these for from 40 to 45 cents per 1,000 cubic feet. It is inferred that the question of cost is very largely one of management, the varied conditions of supply being taken into consideration. The tables as summarized render it quite obvious that under the municipal system consumers generally get their gas, water or electricity cheaper than if it is supplied to them by a private corporation.

For purposes of average and comparison, the numerous plants investigated are summed up in groups according to the amount of their output. In the case of water-works plants it is found that out of eighteen groups compared, with two exceptions, the average price per 1,000 gallons sold was less as charged by the municipal plants. In the case of gas works, out of seven groups which allowed comparison, the lower average price per 1,000 cubic feet was on the side of the municipal plants, with a single exception. Of incandescent electric lighting plants there were ten groups compared, the groups of private plants of 1,000 horse-power or over not having municipal parallels in the table of summaries. The average price per ampere-hour charged to private users was lower for municipal plants in all cases except one, which was for those of 300 and under 400 horse-power. Among arc lighting plants there were fifteen parallel groups which showed in all cases but one that the average price charged per lamp per year was smaller in municipal plants than in private ones.

The fact that the direct price to users was less in the case of municipal plants, however, does not in itself determine their economy, for if the plants are run at a loss, the public will have to make up for it in the end. It is plain from the summaries of water and gas works, at least, that in the majority of cases the private plants have failed to pay a reasonable interest on investment, allowing for depreciation, taxes, etc. A similar unprofitableness seems to be generally true of municipal plants.

A seemingly important fact is brought out in the statement that the average cost per lamp per year to the municipality of arc lights furnished by municipal plants was less than the price charged per lamp per year by private plants to the municipality for lights used in the municipal service, in all groups but one. We are not sure, however, that allowance is here made for depreciation of plant, interest on investment, etc., which might completely alter the state of the case.

If one has an unlimited amount of time to study the voluminous matter contained in this book, and to settle the points which are not evident upon cursory examination, he will doubtless reach some very interesting conclusions. The engineering economist may find it a valuable storehouse of material upon the monetary results of varying engineering conditions since statistics have been collected as to the physical features of the plants investigated, their equipment and the kind and cost of fuel used. Although the data for the plants are given individually, they are published anonymously.

Bending Jigs.

BY JOSEPH V. WOODWORTH.

We sometimes come across a bending job in sheet metal that for one reason or another it would be impracticable to do in the press; sometimes for want of a press, and oftener because the tools themselves would be too expensive. The bending described and shown in the sketch was of this character. Fig. 1 shows the blank, of sheet brass, 1-16 inch thick, with three holes pierced in the position shown, one ¼ inch at *B* and two 3-32 inch at *A*.

The first bend was the one shown at *A*, Fig. 3, which was to bend over the end so that both holes would match and leave enough space to insert the small roller *a*, Fig. 3, the holes forming bearings for the roller, allowing it to turn freely. The bend was done in the jig shown in the two views, Fig. 4. *C* is an oblong block of cast iron with two ears *s* cast on to allow

of its being fastened to the bench; this was the body of the jig. *E* is a piece of tool steel worked out and finished in the way shown, and fastened with two screws and two dowels. This acted as the bending form. It was cut away taper, as shown at *F;* it was also cut away at the bottom, and left with a square shoulder, so as to allow the work to slip under, and the shoulder acted as a gage to push the work against. This piece was hardened and drawn. *H* was the bender, which consisted of a machine steel forging, turned and finished on the centers, leaving a square shoulder and a bearing at each end. The handle also was finished on the centers. It was then cut away to the center, as shown at *I,* to 1 inch from the end. The side pieces or bearings *G G* were got out and finished and fastened one on each side of the block *C,* so that when the bender was down the center or flat part *I* would be level with the top of the block *C.* The pieces *G G* were held by screws and dowels, as shown. The gage pin *K* was then put in, and the block cut away to allow of the easy removal of the work. The work was placed in position by entering the hole at *B* over the gage pin *K,* and pushed under and against the piece *E,* as shown. This finishing the jig, it was fastened to the bench by two wood screws through the ears *D D,* and was ready for work. The work being in position, the bender *H* was brought up quickly, which caused the end of the work *J* to bend over the thin part of the former *E,* which finished the operation. The piece was then easily removed and the next inserted.

The second bend, the one at *B,* Fig. 2, was a simple right angle bend, and was done in the same way as the first, as will be seen in the two views in Fig. 5, using the same style of block as in the other case, the same kind of side pieces, and in fact the same mode of construction, except that the bender *N* was of a different shape. It was cut away to the center, as the other was, and after the ends or journals were inserted into the side pieces *M M* they were set above each side of the block enough so that when the bender *N* was in the position shown in the bottom view there would be just space for the work *S* to pass under freely. Instead of the bending form *E* used in the first operation, the edge of the block was used as such. After the work *S* was placed in position on the block, the gage pin *T* entering the hole in the work as shown, and the sides of the piece held between the two stop pins, the bender *N* was brought down sharply, which caused the part of the work projecting over the edge at *R* to be bent over the edge of the block at *P,* which completed the bend and finished the piece. After the lads became accustomed to the jigs they turned out the work as fast as it could have been done in the press, without the constant danger of having their fingers clipped, and also, as will be seen, by very simple and inexpensive tools, which cuts quite a figure in manufacturing nowadays, when competition is so keen. I have no doubt that the tools described in the foregoing will seem very slow and ancient to some of your readers who are accustomed to doing all work of this kind in the press, but I can only say to them, try it.

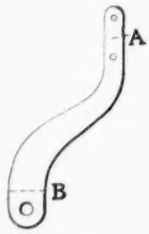


Fig. 1

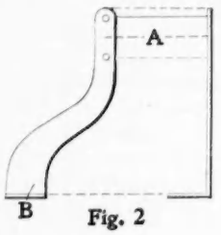


Fig. 2

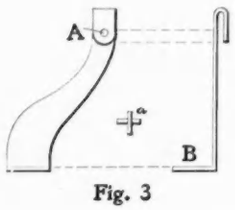


Fig. 3

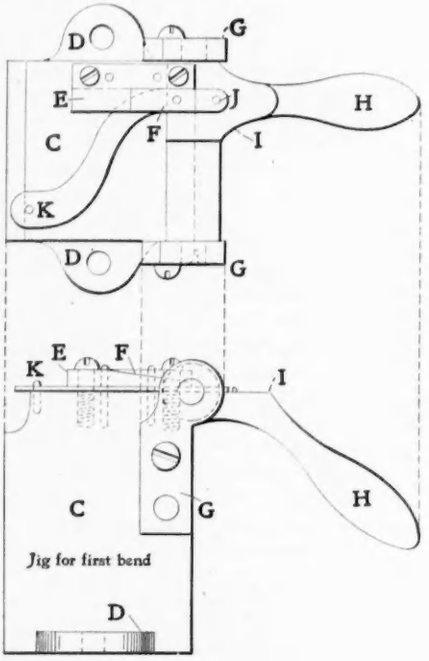


Fig. 4

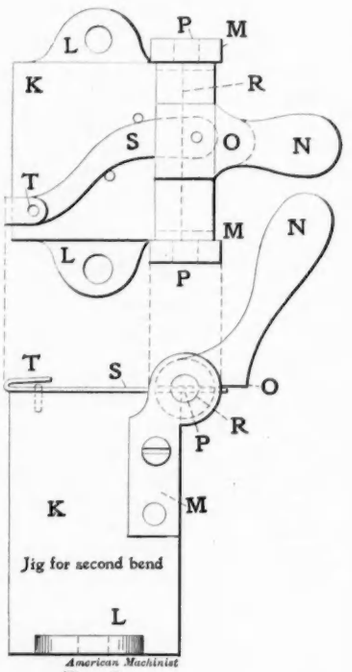


Fig. 5

BENDING JIGS.

Legal Notes.

BY WM. MARSTON SEABURY.

OWNER OF MACHINERY NOT LIABLE FOR UNKNOWN DEFECT.

While Joseph Bien was in the employ of Herman Unger he received certain injuries, to recover damages for which he brought suit against his employer in the Circuit Court of Essex county, N. J.

It appeared that the plaintiff was engaged in the operation of a trip hammer that should have remained suspended above a die until released by pressure upon a treadle. This hammer descended without apparent cause and crushed the plaintiff's hand while he was in the act of feeding metal to the die.

The plaintiff received a verdict and judgment in his favor in the trial court, from which the defendant appealed to the Court of Errors and Appeals of New Jersey. There was no direct evidence as to how the accident occurred, although it was not disputed that the hammer had descended when it should not have done so on other occasions, but in every such instance it appeared that this was caused by some obvious mechanical disorder, by reason of which some part broke away from the rest or became jammed, and remained so until it was repaired. One witness testified that the "hammer would go up and down," but on cross-examination explained that he meant that the hammer would come down near the die, or even touching it, and stay there until it was pushed up again to its place by the operator.

The appellate court came to the conclusion that the plaintiff had failed to make out a *prima facie* case, and that the complaint should have been dismissed. In writing the opinion Mr. Justice Garrison said: "To charge the master with negligence in permitting the use of this machine because of its unaccountable tendency to behave in a dangerous fashion, something in the nature of scienter must be proved, or at least be fairly inferable from the testimony." (46 Atl. R., 593.)

EMPLOYEE NOT NECESSARILY RELIEVED BY EMPLOYER'S ASSURANCE.

Edward Rohrabacher, a man of about forty-five years of age, was employed by

Lyman E. Woodward to operate a surface wood-planing machine. Prior to January, 1896, Rohrabacher had worked for Woodward for 18 or 19 months in the operation of a wood planer. In January of that year a new machine was placed in operation instead of the old one. The machine was about 3 feet wide and 6 or 7 feet long. A little more than half way back from the front of the machine its surface was divided into two parts by a throat which extended entirely across the width of the machine. Just below this throat was a square shaft which made about 4,000 revolutions a minute, and to which were attached two knives. After operating the machine for a few days Rohrabacher noticed that it was dangerous to plane short pieces of wood on this machine, and called the matter to his employer's attention more than once. His employer assured him that it was perfectly safe, and relying upon the assurance he continued to use the machine until the December 6 following, when, planing a short board, the board kicked and his hand was thrown into the throat of the machine and was very seriously injured. Rohrabacher brought suit against Woodward in the Circuit Court of Michigan, Shiawassee county, to recover damages for his injuries thus received. The case was submitted to the jury, who rendered a verdict for the defendant. The plaintiff appealed to the Supreme Court of Michigan, contending that after having assured the plaintiff of the safety of the machine the employer could not be heard to say, "You assumed the risk. You were guilty of contributory negligence in doing what I commanded you to do." The Supreme Court of Michigan affirmed the judgment of the lower court, Justice Moore rendering the opinion that "One cannot continue to operate a machine which he knows is dangerous simply upon the assurance of his employer that it is not, if he has just as much knowledge of the danger arising from the operation of the machine as his principal has." (82 N. W. R., 797.)

Paris Exposition Awards.

The official list of awards to exhibitors at the Paris Exposition has been made public. One thousand nine hundred and eighty-one prizes were given to exhibitors from the United States. United States Commissioner General Ferdinand W. Peck is appointed a Grand Officer of the Legion of Honor.

The entire list of awards is too long for republication in our columns. The following are those in which our readers should be most interested:

DEPARTMENT OF MACHINERY—GROUP IV.

GRAND PRIZES.

Worthington Pumping Engine Co.
Batcheller Pneumatic Tube Co.
Brown & Sharpe Manufacturing Co.
Pratt & Whitney Co.
E. W. Bliss Co.
Niles Tool Works Co.
J. A. Fay & Egan Co.

GOLD MEDALS.

Ball Engine Co.
William Sellers & Co.
George F. Blake Manufacturing Co.
Tinius, Olsen & Co.
Otis Elevator Co.
Rand Drill Co.
Charles A. Schieren & Co.
Crane Co.
Ingersoll-Sergeant Drill Co.
Shaw Electric Crane Co.
Simonds Manufacturing Co.
Chicago Pneumatic Tool Co.
Morse Twist Drill and Machine Co.
Cincinnati Milling Machine Co.
Hendey Machine Co.
Warner & Swasey.
Norton Emery Wheel Co.
Bement, Miles & Co.
E. C. Atkins & Co.
Gisholt Machine Co.
Jones & Lamson Machine Co.
F. E. Reed Co.
Deering Harvester Co.
Bullard Machine Tool Co.
Pond Machine Tool Co.

DEPARTMENT OF MACHINERY—GROUP V.

GRAND PRIZES.

American Steel and Wire Co.
E. C. Acheson.
Rowland Telegraphic Co.
Western Electric Co.
John A. Roebling's Sons Co.

GOLD MEDALS.

Bullock Electric Manufacturing Co.
Lorain Steel Co.
Western Electric Co.
Alvin Manufacturing Co.
National Carbon Co.
Tiffany Glass and Decorating Co.
C. J. Toerring Co.
Ward, Leonard & Co.
Helios-Upton Co.
Holophane Glass Co.
Hart & Hegeman Manufacturing Co.
Edison Phonograph Co.
Western Electrical Instrument Co.
Mica Insulator Co.

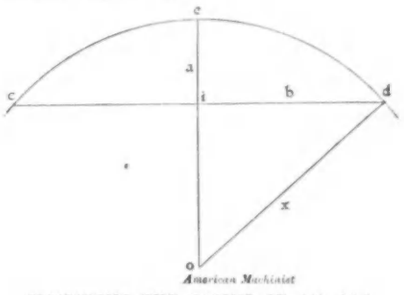
Renewal of Application for Patent.

It has been the practice of the Patent Office for many years past to accept renewal petitions for lapsed allowed applications signed simply by the attorneys who filed the original applications, and not, as required by law, by the "inventor, discoverer, or assignee." The matter was recently called to the attention of the Commissioner of Patents, and a circular was issued by the department to parties interested, calling attention to the statute governing the case, by which the law requires the petition for renewal of allowed applications forfeited through failure to pay the final fee within six months from date of allowance to be signed by the inventor, discoverer, or assignee; and that such application must be filed in the Patent Office within two years after the allowance of the original application. In the event that the inventor be dead, then the petition must be signed by the administrator, or the executor; if insane, by the guardian, conservator, or legal representative. It will not be accepted if signed by the attorney.

Protests have been entered with the commissioner against this ruling, but he states that, while it is furthest from his desire to disturb any practice that has been followed and permitted for years past, yet antiquity of practice cannot justify an illegal act. A. F. T.

Finding the Radius.

In the "American Machinist," No. 33, Mr. B. Nogel, Jr., gave us a formula for finding the radius of an arc of a circle. The illustrative cut and the formula are here reproduced and will be understood without explanation.



COMPUTING THE RADIUS OF AN ARC.

$$\frac{a^2 + b^2}{2\,a} = \text{radius.}$$

An editorial note appended to Mr. Nogel's contribution, which assumed to show that the formula gave only an approximate result, would have distinctly demonstrated its accuracy and reliability, but for an unfortunate error in the solution of the illustrative equation given. This equation is here reproduced corrected, b being 8 inches and a being 1¾ inches.

$$x^2 = b^2 + (x - a)^2$$
$$x^2 = 64 + (x - 1\tfrac{3}{4})^2$$
$$x^2 = 64 + x^2 - 3\tfrac{1}{2}\,x + 3\ 1\text{-}16$$
$$3\tfrac{1}{2}\,x = 67\ 1\text{-}16$$
$$x = 19.16$$

This result is precisely the same as would be more easily obtained by Mr. Nogel's formula.

Inquiries for Machinery.

(130) Wanted names of manufacturers of lathes or other machinery for turning billiard balls.

(131) A foreign correspondent wishes the name and address of a firm that exhibited a horse-nail making machine at the Hamburg Exhibition. Any reader who can send the address to us will confer a favor by so doing.

The "Berliner Tageblatt" has exposed a concern operating under the title "Syndicate of International Exhibitions for Trades and Industries," which has been issuing medals and diplomas.

Questions Which Must be Answered.

We are always sorry for the editors, but more so for the readers, of the journals which maintain perfunctory pseudo-mechanical "departments" that have to be filled with something or other. If the thing was not so sad, it would be a constant source of amusement, as funny things are plentiful in these departments. Here is what would seem to be a simple question, easily answered: Q.—I am building and equipping a new mill. What should be the drop of the hangers for the center shaft and for the main shaft? A.—Have the hangers long enough for the largest pulleys on the respective shafts to clear. If there are beams or other projections between the shafts to interfere with the belts, then the hangers must be enough longer to enable the belts to clear.

Here is, *verbatim*, a question and answer from a recent issue of one of our contemporaries:

"Q.—I am laying out the shafting for our new mill, and would like to have you inform me whether a hanger with a 14-inch drop would be all right for the center shaft, and would a hanger with a 20-inch drop be the right size for the main driving shaft? A.—It would be necessary for us to know all of the conditions as regards machinery and power and the shafts in question before we could risk an opinion upon the proper drop for the hangers. If our correspondent is simply transferring all of the power on one shaft to another, it would, of course, be necessary to have the same sized hangers on each shaft; but if he is only transferring a portion of the power from the main shaft to a countershaft, a hanger with a longer drop might answer for the counter. The decision of such questions as these depend altogether upon the conditions existing in the mill, such as power, size of pulleys, etc."

The director of the Department of Science and Technology, Pratt Institute, Brooklyn, N. Y., sends us a pamphlet containing the courses of study and general information. In sending it attention is called to the fact that the courses are not intended to train expert engineers or specialists, as are those of the best engineering schools of this country, in which the work is necessarily so theoretical and involves so much higher mathematics that it is necessary to spend the whole of the first two years on top of a good high school education preparatory to taking up any of the technical work of the last two years. The aim at Pratt Institute is to make their work thoroughly practical, using drawing-board and laboratory methods wherever possible, and to simplify their class-room and theoretical work so as to require no mathematics higher than plane trigonometry. Starting with lower requirements for admission, they are thus able in two years to give their students a thorough training in the theory and practice of mechanical and electrical work, which prepares them later to fill positions of superintendents, managers, chief draftsmen and designers in industrial plants.

One of the most profitable postoffices in the United States is that at Scranton, Pa. The volume of business is unusually large, and is steadily increasing, the figures for the first six months of the present year showing more than double the business for the same months in 1893. This is due principally to the rapid growth of the International Correspondence Schools. Seven years ago the schools' postage was barely 5 per cent. of the total, but now one-third of Scranton's postage is paid by the International Correspondence Schools. Their postage has increased from an average of less than $400 to over $5,000 a month.

A school has been established by the government at Fort Monroe, Va., for the purpose of instructing regulars in the application of electrical machinery used in the army. The rules, published by direction of the Secretary of War, provide that the applicant must be under twenty-five years of age, unmarried, qualified as a gunner, a student of a correspondence school or the owner of electrical books, and no applicant will be recommended unless he has sought for a year or more to become practically familiar with one or more classes of electric machinery or with some portion of the elementary literature on electricity.

The M. S. Friede Company, 320 Broadway, New York, whom our readers will remember as having been concerned in heavy buying of American machine tools and other supplies for the Trans-Siberian Railroad, have started a monthly "Journal of Industry and Trade" for the furtherance of Russo-American commercial relations. It is printed in the Russian language.

New Catalogs.

The Carborundum Company, Niagara Falls, N. Y., sends us a catalog, No. 3, in which the processes of manufacturing carborundum are explained at some length with the aid of illustrations. Diagrams and prices of special carborundum wheels, as well as regular forms of wheels and other products, are included in the catalog. Size, 6¾x9¼ inches.

Manufacturers.

The Reading Iron Company purposes erecting a steel plant in Reading, Pa.

Mayor Driscoll will erect a building on Commerce street, New Haven, Conn., for factory purposes.

An addition will be built to the factory of Geo. B. Grumman, manufacturer of ice tools, etc., Branchville, Conn.

The erection of a felting factory at the site of the old hoe factory on Griswold street, Binghamton, N. Y., is going forward.

Wm. Deschart, 1830 Morgan street, St. Louis, Mo., has a permit for the erection of a three-story factory, at a cost of $13,142.

The Marble & Shattuck Chair Company, now located at Bedford, O., will remove to Glenville, O. A site has been purchased.

The South Florida Sugar Planting & Refining Company has selected 41 acres located on Hookers Point, Fla., for a big refinery.

About thirty men are at work on the building to be occupied by a cotton seed oil mill at Cullman, Ala. Part of the machinery has arrived.

It is understood that the Frankford Forge Company, Philadelphia, contemplates erecting a large manufacturing plant at Eddystone, Pa.

Kilby Manufacturing Company, maker of special machinery, Cleveland, O., is going to build a $25,000 addition to its plant on Hamilton street.

The work of construction of a new plant of the Acme Harvester Company, at South Bartonville, near Peoria, Ill., is progressing at a rapid rate.

The National Casket Company has completed arrangements to erect an addition to its plant in Allegheny, Pa., land having been bought for that purpose.

The Edward Ford Plate Glass Company, at Rossford, a suburb of Toledo, O., is building a new plant. It has been delayed constantly about getting the machinery.

Appleton, Wis., has been endeavoring to secure a factory of the Bell Watch Company, Mansfield, O., for making watch movements and to employ 300 to 500 men.

The Wisconsin Carriage Company, Janesville, Wis., recently burned out there, will erect a new model factory, to employ 100 hands and to cost about $25,000.

The Lancaster Cotton Mills, Lancaster, S. C., have increased their capital stock from $150,000 to $1,000,000, and will erect a new building, 125x360 feet, four stories.

A new factory, to employ about 140 hands, is to be erected at West Hazelton, Pa. Among those influential in bringing it there are Charles F. Hill and A. T. McAllister.

A big cotton seed oil mill will be built in Thomaston, Ga., at an early date. The plant will cost $25,000, and all the money has already been raised and charter prepared.

Boilers are being placed in the big unoccupied sugar refinery building at the foot of Penn street, Camden, N. J., where a new manufacturing industry will be established.

The Camden Lace & Embroidery Works, at Front and Pearl streets, Camden, N. J., employing 1,200 operatives, is about to increase its plant by the erection of another large mill.

The Scott Fertilizer Company, of Elkton, Md., has purchased property adjoining its works, and will begin at once the erection of a plant for the manufacture of sulphuric acid.

A new boiler-house and a 110-foot chimney will be built and other improvements made, it is said, at the mills of the Farnsworth Company, woolen manufacturer, Lisbon Center, Me.

Cuero, Texas, is stated to have settled the power and light question, as also the size of the building for a cotton factory which is to be erected there. The main building will be 75x125 feet.

A large number of prominent cotton factors have been at Pensacola, Fla., attracted by the beginning of work on the new large compress of the William H. Burce Co., of New Orleans.

A plant for the manufacture of novelty glassware will be built on or near Harris street, Eaton, Ind. Lucky & Haynes have the